IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

FINESSE WIRELESS, LLC,	(	CAUSE NO. 2:21-CV-316-JRG
	)	
Plaintiff,	(	
	)	
vs.	(	
	)	
AT&T MOBILITY, LLC, et al.,	(	MARSHALL, TEXAS
	)	JANUARY 11, 2023
Defendants.	)	8:30 A.M.

VOLUME 3

TRIAL ON THE MERITS

BEFORE THE HONORABLE RODNEY GILSTRAP
UNITED STATES CHIEF DISTRICT JUDGE

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EXAMINATION

THE COURT: Be seated, please.

Are the parties prepared to read into the record those items from the list of pre-admitted exhibits used during yesterday's portion of the trial?

MS. FAIR: Yes, Your Honor.

THE COURT: Please proceed.

MS. FAIR: All of these exhibits were admitted by the Plaintiff, and they are all PX numbers: 518, 558, 580, 582, 611, 669, 672, 715, 832, 855, 858, 918, and 951.

THE COURT: All right. Is there any objection to that rendition?

MR. DACUS: No, Your Honor.

THE COURT: Is there anything else to read into the record to make this complete?

MS. FAIR: No, Your Honor?

THE COURT: All right. Thank you.

Mr. Dacus, yesterday you indicated outside the presence of the jury that you wished to make an offer of proof regarding a matter. Let's do that at this time.

MR. DACUS: I'd be happy to, Your Honor. Thank you.

As Your Honor knows, we have sought to admit a covenant not to sue and license between the Plaintiff Finesse and Verizon. The covenant not to sue and license relates to the patents-in-suit. It also relates and covers Galaxy radios which are the same accused products in this case.

We believe that covenant not to sue and license is relevant to damages, the hypothetical negotiation, including but not limited to *Georgia-Pacific* factor No. 1. And the Court -- our understanding is the Court has excluded that covenant and license not to sue, and so we would like to make an offer of proof.

With the Court's permission, Your Honor -- there is a filing with the Court related to this by the Plaintiff Finesse filed on December 7th, 2022. And with the Court's permission, I'd like to mark that as offer of Exhibit No. 1 and tender that to Ms. Brunson to include in the record of the Court.

THE COURT: Well, it's already in the record. We can either do it by reference, or if you want to physically hand the Courtroom Deputy a copy of it, that's fine, too. I think it's clear in the record either way.

MR. DACUS: Okay.

THE COURT: Do you have the document number from that prior filing you want to reference?

MR. DACUS: That's what I was looking for. Yes, Your Honor. To be clear, it's case 2:21-CV-316, and it's Docket No. 232 in the Court's filing. And I do have a paper copy that I would tender to the Court with the Court's permission.

THE COURT: That is from the Verizon case?

MR. DACUS: Yes, Your Honor.

THE COURT: Okay. Thank you for that offer of proof. The Court's prior ruling stands, and I deny your request to introduce the covenant not to sue and the other related matters part and parcel of the conclusion and resolution of the case against Verizon.

As I mentioned yesterday, in response to this request, I granted leave and permitted Nokia and AT&T to examine Finesse in this case about the knowledge that it gained through the case against Verizon and the information that was received through discovery there without identifying where it came from or the result of that prior litigation.

The Court's view was that the introduction of what you're requesting here would clearly disclose to the jury prior litigation with Verizon, the resolution of that resolution, it would generate likely confusion in the mind of the jury, it would also likely raise questions about whether compensation was due here in light of compensation that might have been paid elsewhere, it would have raised extraneous issues that are not before the jury here, and the probative value of those matters is exceeded by the prejudicial effect under Rule 403, in the Court's view.

So I have precluded you from explaining to the jury where it came from, but I have not excluded and have given you full leave to explore, as you have already, with witnesses in this trial the information, the substantive material that you

learned and that Finesse learned through that other litigation.

That's the basis of the Court's ruling, and that's why I'm confirming my prior denial of this additional request.

MR. DACUS: Understood, Your Honor.

THE COURT: Thank you.

MR. DACUS: May I tender this to the Court?

THE COURT: Yes. You may approach the Courtroom Deputy.

MR. DACUS: Thank you.

THE COURT: All right. We left off yesterday with the Plaintiff having passed the witness on Mr. Loddeke, AT&T's corporate representative who had been called adversely.

Mr. Dacus, do I understand correctly you're going to examine on cross examination in the form of a direct examination of this witness?

MR. DACUS: That's correct Your Honor.

THE COURT: All right. Mr. Loddeke, you are here in the courtroom. If you'll return to the witness stand, sir, and I'll remind you you remain under oath.

And while he's getting situated on the witness stand, I'll ask the Court Security Officer to bring in the jury.

(Whereupon, the jury entered the courtroom.)

THE COURT: Please be seated, ladies and gentlemen. Welcome back.

As you will recall, we ended the day yesterday with the Plaintiffs having called adversely Mr. Adam Loddeke who's the corporate representative for AT&T, the Defendant in this case.

Mr. Ward examined the witness on behalf of the Plaintiff and had passed the witness at the time we recessed for the evening yesterday. The same witness is back on the stand this morning. He remains under oath, and we'll proceed with cross examination of the witness by counsel for AT&T.

Mr. Dacus, you may proceed.

MR. DACUS: Thank you, Your Honor.

ADAM LODDEKE, PREVIOUSLY SWORN,

testified under oath further as follows:

CROSS EXAMINATION

BY MR. DACUS:

Q. Good morning, Mr. Loddeke.

A. Good morning.

Q. I don't think you were given quite an opportunity yesterday to give the jury a little information about you and your background, so I'd like to start there if that's okay.

A. Yes.

Q. Okay. I guess, first, tell the jury where you live.

A. I live in Frisco, Texas.

Q. Okay. And we know you work at AT&T. Right?

A. That's correct.

Q. Tell the jury, first of all, how long have you worked at

AT&T?
A. I've worked for AT&T a little over 24 years.
Q. And what is your job title at AT&T?
A. My job title is director and member of technical staff.
Q. Before we jump into that, would you also tell the jury what's your educational background, like post high school?
A. Yes. I have a Bachelor's of Science in electrical engineering.
Q. And in your job and role at AT&T, do you essentially operate and have you operated as an engineer or a technical person at AT&T?
A. Yes, I have.
Q. Now, as the director and member of the technical staff of AT&T, give the jury some sense of what your day-to-day job responsibilities are, what it is you do.
A. Yes. I'm responsible for kind of the technical hardware and software requirements of the radio access, RAN, network. We typically look out from -- what goes in the network today, we kind of look out 18 months into the future.
Q. So as part of that, are you responsible for selecting products that go into the AT&T network?
A. Yes, I am.
Q. And how long have you been in that specific role?
A. I've been in this role approximately three years.
Q. And before you were the director of the technical staff,

what was your job title?
A. It was director of ran engineering.
Q. You said that word RAN a couple of times. What does that stand for?
A. It stands for radio access network.
Q. Okay. And as the director of RAN engineering, did you say that was just for north Texas?
A. That's correct.
Q. Okay. So that includes the Dallas area, Marshall, this area in particular?
A. Yes. I have responsibility for the northern half of Texas. So out east or out east was all the way through Marshall; north, obviously Sherman, Denison; south went just south of Temple, Killeen; and then we went all the way out to El Paso.
Q. So as the director of RAN engineering, give the jury a sense of what your job duties were in that role.
A. In that role we were responsible -- I was responsible for the engineering of the radio access network. So my team had responsibility for design, optimization, performance, and capacity management of the AT&T network in the northern half of Texas.
Q. So if there was an issue with the performance or the operations of the AT&T network, were you the guy that somebody would call --

A. Yes.
Q. -- or look to?
A. Yes.
Q. And how long were you in that specific role?
A. I was in that role for about seven years.
Q. Okay. So seven years in that role. You've been in the director role now for three or four years. Fair to say that over the course of the past decade at least, you've had experience, both in how to design and operate the network, choose products going forward, and experience with the performance of the network?
A. Yes.
MR. DACUS: Can we pull up the Demonstrative Exhibit 1, please, Mr. Horseman?
Q. (BY MR. DACUS) So we've talked a lot about the radio access network in this case. But just so everyone's clear, what do we see on the screen here?
A. So on the screen here, you kind of have -- you have antennas, and generally we have three to four antennas per sector. And typically a site, which this would -- you know, this mono pole here, you would have three sectors on a site. So typically AT&T would have between 9 and 12 antennas on a site.
And these are kind of examples of the radios. And, again, we have multiple radios supporting those antennas on a

cell site. And sometimes they are mounted in the open like this, and sometimes they get mounted right behind the antenna themselves.

Q. So for the purposes of the jury, what I just circled over your circle on this exhibit, those are the radios that are at issue in this lawsuit?

A. Yes, they are.

Q. Okay. And just for purposes of clarity, how many on average radios would be at a cell tower or cell site in the AT&T network?

A. On average, we have between 12 and 15 radios per -- per site.

Q. And to give us some perspective, how many radios does AT&T have nationwide in its LTE network?

A. We have about a million radios in our network.

MR. DACUS: We can take that down, Mr. Horseman. Thank you.

Q. (BY MR. DACUS) Does AT&T buy those radios from others?

A. Yes, we do.

Q. And from whom do you buy them?

A. We buy them through Nokia and Ericsson.

Q. Just those two?

A. We do have a few radios that we buy in the end building space through Corning and CommScope.

MR. DACUS: Can we pull up Demonstrative Exhibit 2,

please, Mr. Horseman?
Q. (BY MR. DACUS) And can you give the jury some sense of how much of the AT&T network is covered by Ericsson radios versus Nokia radios?
A. Yes. Ericsson accounts for about 65 to 70 percent of the AT&T network, and Nokia is the remaining 30 to 35 percent.
Q. And so explain to the jury what it is we're showing on this Demonstrative Exhibit 2.
A. So these dots represent cell sites. And the blue dots represent Nokia and the red represent Ericsson. So Ericsson tends to cover most of the larger markets. So you might not see as many dots here because cities like Chicago, LA, San Francisco, Dallas, Houston, are just overlay with multiple dots. The biggest Nokia market we have is -- is New York City.
MR. DACUS: We can take that down, Mr. Horseman.
Q. (BY MR. DACUS) Do the Ericsson radios that you buy have the PIM cancellation feature?
A. No, they do not.
Q. And we've been talking about these radios a lot. Can you give the jury some sense of how many features or functions these radios and base stations include?
A. Yeah. We tend to have over probably a thousand features and capabilities in kind of the RAN access part of the network.

Q. So in case we are obviously focused on the PIM cancellation feature. Right?
A. Correct.
Q. But you are saying that's just one of more than a thousand features that are included in these radios and base stations?
A. That's correct.
Q. And the other features in the radio and base station, do they relate to how to optimize the performance of the AT&T network?
A. Yes, they do.
Q. Let's talk about what issues you see in the course of your job duties that affect performance on the AT&T wireless network. Can you just describe for the jury what issues you see that can affect performance?
A. Yeah. Four of the primary issues we deal with from a performance perspective tend to be transport outages or intermittent issues with the transport. There is hardware failures. There are software issues, bugs, and power outages.
Q. And we're obviously talking about interference issues in this case. Are there multiple types of interference issues? And if so, can you tell the jury about them at a high level?
A. Yes. There's multiple interference issues, one of which, as we've discussed, is PIM, passive intermods. But we also have to manage external interference that can come from, you

know, for example, a jammer in some cases. It could be a faulty equipment in the field that's causing some sort of spurious emission that's interfering in our band. And then there's also this term I think that's come across is out-of-band emissions. So that's another issue that we run into from a site design perspective.

Q. Does AT&T have wireless engineers that deal with these issues that you've described for us?

A. Yes, we do.

Q. And about how many?

A. We have over a thousand engineers focused on all of these issues.

Q. And with respect to the PIM issue, does AT&T have an engineer who has responsibility for the PIM issue?

A. Yeah. We have one person that's dedicated to kind of PIM in general.

Q. Does -- describe for the jury the types of PIM, or passive intermodulation, that you see as the director of the technical staff at AT&T.

A. So we have internal PIM, which is PIM that gets generated between the radio and that antenna. You have -- think of it you have a radio; there's a coaxial connection, cable connection, between the radio and the antenna. Sometimes there could be other network elements in between that, but predominately that's what it is. And that's between that

radio and the antenna I would consider internal PIM.
Q. Let me pause you there, Mr. Loddeke, if I could, because I failed to pull up and it might be helpful.
MR. DACUS: DX 95, please, Mr. Horseman.
Q. (BY MR. DACUS) Do you know what this document is, sir?
A. Yes.
Q. What is it?
A. It is a document that covers the FirstNet site hygiene mitigation guidance that goes into the field.
MR. DACUS: And can we turn to page 3, Mr. Horseman?
Q. (BY MR. DACUS) By the way, is this a document that these descriptions would have been the same descriptions that AT&T utilized before this lawsuit was filed?
A. Yes.
Q. You were describing for the jury internal PIM. Does this document actually contain AT&T's interpretation or definition of internal PIM?
A. Yes, it does.
Q. And what about external PIM? What is that?
A. So external PIM would be caused outside of that antenna feed line system. So it could be, for example, that PIM could be coming from an air-conditioning unit on a roof top, it could be a metal roof on a building. You hear the term rusty bolt a lot. So those are sources of that external PIM.
Q. In DX 95 under external PIM, it says, "It is more

difficult to find and resolve." Is that your experience at AT&T?

A. Yes, it is.

Q. And can you explain to the jury why?

A. With internal PIM, you know where it's coming from. It's between the radio and the antenna itself. So, you know, it's much easier for a tower crew to look for loose connections or replace either a bad antenna or bad jumper cable.

With external PIM, you have to find where the source of that is, and it -- like you said, it could be even a rusty bolt, it could be the air-conditioning unit, and finding the sources of that is a lot more challenging.

Q. Does AT&T have a formal policy or strategy on how to deal with PIM?

A. Yes, it does.

MR. DACUS: Mr. Horseman, can we pull up DX 305, please?

Q. (BY MR. DACUS) Can you tell the jury what this document is, please, sir?

A. Yeah. This document kind of covers the PIM mitigation guidance and solutions that we follow within AT&T.

Q. Okay.

MR. DACUS: Can we turn to page 5, Mr. Horseman?

Q. (BY MR. DACUS) There's a chart at the top of page 5. And can you just at a high level--and then we'll walk through

each step--tell the jury what this is or what it depicts?
A. This depicts kind of the steps that we at AT&T go through for PIM mitigation.
Q. So with respect to step 1, can you describe what that -- what the policy or strategy is within AT&T?
A. Yes. So this is in the design phase. So this is where the engineers specify antennas and jumpers, and we make sure that we're using high quality, PIM-certified equipment that would be installed at the cell site.
Q. Is step 1 related to internal or external PIM?
A. It's more probably addresses making sure that we minimize the potential for internal PIM in the future.
Q. Okay. And what about step 2?
A. So step 2 is -- this is where we go kind of through the site-scoping process. This is where we work with our construction teams. And if we see anything from a tower perspective that could cause problems, for example, antennas could be not perfectly flush mounted on a particular sector or there may be potentially pointing in the back of one another, that would be something that would get flagged in this step. And we would make sure, before we finalize the design, that we've done everything necessary to ensure a high quality solution before it hits the field.
Q. Does that relate to internal or external PIM?
A. Generally more impacts the external PIM.

Q. And then what's step 3 in the formal policy or strategy of AT&T?
A. So step 3 is -- this is where the tower crews are doing the actual installation of the -- potentially any radios, new antennas on the tower. And this is where we would be focused on the tower crew would be able to due internal PIM tests using test equipment. And in this case the -- the intent would be for the tower crew to leave the site with no internal PIM.
Q. And what is step 4 at a high level?
A. So step 4 is kind of the process by which we do additional testing after the tower crew has left to verify whether any sort of PIM is present.
Q. With respect to internal PIM, is there a general high-level strategy of how to address it within AT&T?
A. Yes.
Q. And what is that?
A. We identify the source of the problem and -- and fix it.
Q. And when you say fix it, do you mean you perform hygiene or repair on the internal PIM?
A. Yes. So, for example, if you've got a bad antenna or a loose connection, you know, if it's a bad antenna, you'd replace it. If the jumper was kinked, you'd replace the jumper. If you have loose connections, you would tighten those connections to spec.

MR. DACUS: Your Honor, may I approach the flip chart?
THE COURT: You may.
Q. (BY MR. DACUS) So you were here when the Plaintiff's technical expert, Doctor Wells, testified?
A. Yes, I was.
Q. And you were here when their damages expert, Doctor Bazelon, testified?
A. Yes.
Q. And did you hear them say that their opinion and their assumptions in this case are that site hygiene is not a way to remedy or mitigate internal PIM?
A. Yes.
Q. As the engineer or one of the engineers at AT&T responsible for internal PIM, do you, in fact, use site hygiene to mitigate or cure internal PIM?
A. Yes, we do.
Q. Okay.
MR. DACUS: Can we go to the next page, please, Mr. Horseman? If we could blow that up just a little bit. Thank you.
Q. (BY MR. DACUS) And can you tell the jury what this is?
A. This is kind of that phase 4 piece where we go through the PIM mitigation process in more detail.
Q. Okay. And let me start by focusing on this 2b right

here. Do you see that here on the screen?

A. Yes, I do.

Q. And can you describe for the jury what this flowchart in the section 2b is describing?

A. So after we've done, we call it, an M. pilot test, this is where we load up the carriers to full power and full load, so a hundred percent of capacity, we can simulate that on our cell sites. So during the maintenance window before we launch the site into commercial service, we would run it on full load, full power, to determine whether or not any PIM was present. And based on the results of that test, we would dictate whether or not internal or external PIM was present.

Q. You were here -- you've been here for the entirety of the trial. Correct?

A. Yes, I have.

Q. Do you remember when Mr. Nelson cross-examined Mr. Smith? You were here for that?

A. Yes.

Q. And you remember there was a Finesse document, DX 160, that said the primary source of internal PIM is at installation? Do you remember that?

A. Yes.

Q. And is that consistent with your experience?

A. Yes, of installation as the primary.

Q. And so what I want to make sure I and the jury understand

is, what does AT&T do to make sure there is no internal PIM at the time these radios are installed?
A. So, again, we have kind of the step 3 where the tower crew is responsible for that piece of doing some testing. But also after the tower crew has left in phase 4 here, we verify through our internal tests whether or not any PIM is present. And we do not proceed to any of the further steps until we verify that no internal PIM exists. And without -- you have to go beyond the step 2b before you could actually even launch that carrier into service.
Q. So at the time that these radios are installed and they're turned on for service, how much internal PIM would be present?
A. Zero.
Q. The remainder of this flowchart, I'll just kind of draw a line through it on the screen, what do all those steps relate to?
A. External PIM.
Q. In your experience, is external PIM not only more prevalent and present, but is it harder to remedy and cure?
A. Yes, it is.
MR. DACUS: We can take that down, Mr. Horseman. And can we pull up PX 611, please?
Q. (BY MR. DACUS) Before we talk about this document, I'd like to ask you one other question, Mr. Loddeke, about this

internal PIM and installation. Is that okay?
A. Yes.
Q. Okay. You were here when Doctor Bazelon testified about damages yesterday, and he agreed and acknowledged that he calculates damages starting from the very moment that we turn on our radio with the PIM cancellation feature. You heard that?
A. Yes, I did.
Q. And you heard him say that what at least allegedly it's doing is calculating the amount of PIM cancellation that occurs. Correct?
A. Correct.
Q. But at the time that we turn the radio on with PIM cancellation, how much internal PIM is there?
A. It should be zero.
Q. Okay. Now, do you recognize Exhibit PX 611?
A. Yes, I do.
Q. You've been here for the trial. This is a document actually that the Plaintiffs showed in opening and it's a document that Mr. Ward showed to you yesterday. Correct?
A. Yes.
Q. Now if we --
MR. DACUS: Actually, there's a first page, Mr. Horseman, if we could just show the exhibit number, and we'll just start here.

Q. (BY MR. DACUS) What does this presentation relate to?
A. You can see in the header up top, it says, External PIM Mitigation in the Design and Construction.
MR. DACUS: If we turn to the second page you were on Mr. Horseman, please?
Q. (BY MR. DACUS) And what's the title of the document?
A. It's Proposal for External PIM Mitigation in Engineering Design and Construction Development, RAN, and C & E phase.
Q. So is it your understanding this is a document that was related to the mitigation of internal or external PIM?
A. External.
MR. DACUS: And, Mr. Horseman, if we could go to the fourth page, please, sir.
Q. (BY MR. DACUS) You remember this is the document that the Plaintiff showed in their opening statement, and they pointed out PIM is the grim reaper of design and construction?
A. Yes, I do.
Q. Did you understand that to relate to internal or external PIM?
A. In the context of this document, it would be related to external PIM.
Q. Okay.
MR. DACUS: We can take that down, Mr. Horseman. Thank you.
Q. (BY MR. DACUS) The strategy and the policy for how to

deal with internal PIM that you've described for us of find it and fix it, repair it, does that apply to both the Nokia radios and the Ericsson radios in the AT&T network?

A. Yes, it does.

Q. Now, at some point in time after installation, is it possible and does it happen that internal PIM can arise?

A. Yes.

Q. Okay. And if it does arise, what's our first tool in the toolbox for how to remedy it?

A. The first tool would be to identify the source of the internal PIM and fix it.

Q. Okay. And do we have any other tools in our toolbox that we use?

A. Yes. Another -- another option that the engineers have is to lock one of the bad receive branches. So typically between the radio and the antenna, there are four branches for transmit and receive, and the engineer had the ability through internal PIM, if there's one of those legs that they identified as problematic, they would be able to go in and lock that bad receive path.

Q. And how long would that take?

A. The engineer could do that in less than a minute.

Q. And by locking down one of the receivers, in your experience, does that have any significant adverse effect on the capacity of the system of the network?

A. It doesn't have a significant impact, especially on these low band carriers.
Q. Now, you've -- we've talked about find it and fix it. We've talked about lock down one of the receivers. This lawsuit, of course, talks about PIM cancellation. Correct?
A. Yes.
Q. Is PIM cancellation one of the tools in the toolbox?
A. Yes, it is.
Q. And so how does it fit into what AT&T does as far as addressing internal PIM?
A. It's one of the tools in the toolkit in the Nokia markets.
Q. And to be clear, are we here saying that PIM cancellation has absolutely no value at all?
A. No, I'm not saying that.
Q. Okay. Are we here saying that it has at best minimal or marginal value?
A. Yes.
Q. Okay. And we have to distinguish between internal PIM and external PIM. Correct?
A. That's correct.
Q. By the way, do we pay -- does AT&T pay any extra amount for PIM cancellation in the Nokia radios when we buy these radios?
A. Not that I'm aware of. I mean, there are some features

that were part of a software buyout. But the radios themselves, I'm not aware that we pay any incremental on.

Q. Can you give the -- as part of your job duties, do you have a sense of what percentage of the time internal PIM is present in the AT&T attachment network?

A. From what I've seen, it's between -- it's less than one to two percent.

Q. And as part of your job duties, do you know -- when internal PIM is present between one and two percent of the time, do you have any information on how effective the PIM cancellation is in remedying that situation?

A. Some of the day we've seen --

MR. WARD: Objection, Your Honor. This witness might be qualified to give expert opinions, but he wasn't disclosed as an expert and I think his question is calling for an expert opinion.

THE COURT: What's your response?

MR. DACUS: I was attempting to ask him from his personal experience, Your Honor. If I didn't, I misspoke.

THE COURT: Well, he's not qualified as an expert. He's not entitled to give opinion testimony. He does have personal knowledge. He can testify and must testify from his personal knowledge. If you want to rephrase the question and clarify that it must come from his own personal knowledge, then I'll allow it.

MR. DACUS: Understood, Your Honor.

Q. (BY MR. DACUS) So with respect to the job duties that you have, do you have an understanding and knowledge about what percentage of the time PIM cancellation is effective in mitigating or reducing internal PIM when it's present?

A. It's effective about 25 to a third of the time.

Q. Now, with respect to the cost of fixing broken radios and eliminating internal PIM, do we track those costs?

A. Yes, we do.

Q. And you remember that both Doctor Wells and Doctor Bazelon said that they felt like site hygiene was not appropriate, in part, because it costs too much money to do it. Do you remember that?

A. Yes.

Q. Do you agree with that?

A. I would not agree with that.

Q. In addition, just so we're covering Doctor Bazelon's assumptions, you remember that he had the assumption that when PIM cancellation is on our radios, that PIM is present. Do you remember that assumption?

A. Yes.

MR. WARD: Your Honor, objection, leading.

THE COURT: Sustained.

Counsel, approach the bench, please.

(The following was had outside the hearing of the

jury.)

THE COURT: All my electronics are on the fritz up here. Is there a good place I could break and send the jury out for a few minutes to get an IT person in?

MR. DACUS: You can do it right now, Your Honor.

THE COURT: I don't want to mess up your examination.

MR. DACUS: No, Your Honor.

THE COURT: Okay. We'll do it now.

MR. DACUS: Thank you.

(The following was had in the presence and hearing of the jury.)

THE COURT: Ladies and gentlemen, there's a matter I need to take up outside your presence. I don't think this will take long, but I'm going to ask you to retire to the jury room.

You can simply close and leave your notebooks in your chairs. Don't discuss the case. Follow all my instructions. Hopefully, this will be just a few minutes. But if you would indulge me, I need you to leave the courtroom for just a minute and we'll have you back in here shortly.

The jury's excused to the jury room.

(Whereupon, the jury left the courtroom.)

THE COURT: Be seated, please.

We're going to go off the record while I get some IT help

with my electronics here on the bench, and then we'll be back on the record and continue with the examination.

We're off the record.

(Pause in proceedings.)

THE COURT: All right, counsel. If you'll take your places, we'll go back on the record now that I've gotten the gremlins out of my electronics here.

Mr. Turner, if you'd bring in the jury, please.

(Whereupon, the jury entered the courtroom.)

THE COURT: Thank you for your cooperation, ladies and gentlemen. Please have a seat.

We'll continue with the cross examination in the form of a direct examination by AT&T and Verizon [sic] as to Mr. Loddeke.

All right, counsel. Please pick up where you left off.

MR. DACUS: Thank you, Your Honor.

Q. (BY MR. DACUS) Mr. Loddeke, with respect to the costs that AT&T incurs in performing hygiene or repairs for internal PIM, does AT&T keep track of those costs?

A. Yes, we do.

Q. And so do you know from your personal experience on average per cell site how much we spend fixing internal PIM?

A. It ranges between $2,000 and $3,000 to fix a site.

Q. Okay.

MR. DACUS: Mr. Horseman, can we pull up DX 318,

please? Blow it up if we can, please, sir, so we can see it a little better. Thank you.

Q. (BY MR. DACUS) Are you familiar with this document, Mr. Loddeke?

A. Yes, I am.

Q. And can you tell the jury or explain to them generally at a high level what it is before we dig into the details?

A. Yes. This document kind of covers the tower repairs that we have associated with PIM and uplink RSI issues.

Q. So when I asked you earlier do you keep track of costs, this is a summary document to show the costs that you incur in performing hygiene or repairs on internal PIM?

A. Yes.

Q. So let's focus on -- first of all, let's just focus on 2022, for example. Let's focus down here on the internal PIM.

Can you explain to the jury what this number is right here beside Nokia?

A. So you've got trouble tickets and vendor tickets. A trouble ticket would be something that gets generated in our network operations center that identifies that we've got a particular issue, and the vendor ticket because we don't -- AT&T doesn't have its own tower crews, that's where we would issue the vendor ticket to the field for somebody to go and fix that particular problem.

And in there are cases where we have to resend the vendor

back out or have to issue another ticket. So that's why the vendor tickets sometimes are slightly higher than the number of trouble tickets we have.

Q. So when you say ticket, is that referring to each time you have to send someone to perform hygiene or repair, you generate a ticket for it?

A. Yes, we do.

Q. Okay. And so let's just -- let's talk at a high level. This covers how many years?

A. It's a little over five and a half years here.

Q. And so if the jury wanted to know the total amount paid for hygiene and repair of internal PIM in those five and a half years, would this tell us that?

A. Yes.

Q. And where is that number?

A. It's at the grand total at the bottom, and it's just under $40 million.

Q. Okay. And for those five and a half years, if we wanted to know the total number of tickets, total number of times we sent a repairman out, would we be able to know that?

A. Yes.

Q. And where is that number?

A. You would have kind of the grand total number at the bottom. It's around a little over 19,000 vendor tickets.

Q. So let's look at 2022 just as an example. For Nokia

radios in 2022, how many tickets were generated?
A. We had 766 trouble tickets.
Q. And how many for the Ericsson radios?
A. 2,080.
Q. Now, why are there more tickets generated for internal PIM for Ericsson than Nokia?
A. A piece of that is the fact that, again, we've got about a 65, 70 percent split between Ericsson and Nokia. So we have just a lot more Ericsson radios out there than Nokia.
Q. A little over double the number of Ericsson radios versus Nokia?
A. It works out about that, yes.
Q. Okay. And how many radios did you say there are total in the AT&T network?
A. There's approximately a million radios in our network.
Q. So for 2022, out of the million radios, how many times did we have to send someone to do site hygiene or repair on those million radios?
A. Sorry. Which -- can you repeat that again?
Q. I'd be happy to. So for 2022, for the million radios, how many times did we have to send someone to do site hygiene or repair?
A. Just under 2900 vendor tickets were issued.
Q. So significantly less than one percent of the radios. Correct?

A. Yes.
Q. Is that consistent with your personal experience in addressing internal PIM?
A. Yeah. Yes, that's consistent.
Q. Now, I do want to address one other issue on here, and that is -- there's a line item for external PIM. What's that referring to?
A. That would be a scenario when, you know, for whatever reason we issued a ticket to the turf vendor. So the turf vendor is who we issue the internal PIM work to. And they would be the one that we would have in this scenario issued an external PIM ticket for them to go investigate something likely on the tower itself where we wanted somebody to do the tower climb.
Q. You told us external PIM is more difficult to find, more difficult to correct. Correct?
A. Yes.
Q. So is this the document where AT&T tracks the cost for external PIM remedy or correction?
A. This does not encompass all of the external PIM costs, no.
Q. Based on your -- is that kept in another document at AT&T?
A. Yes.
Q. Okay. Based on your experience at AT&T, are you able to

tell the jury or give them some indication of how much more expensive it is to remedy and cure external PIM versus internal PIM?

A. We spend 10 to 15 times more per year on external PIM mitigation than internal.

MR. DACUS: We can take that down, Mr. Horseman.

Q. (BY MR. DACUS) Now, as part of your job at AT&T, do you have to make decisions on how to design the AT&T network? Correct?

A. Yes, I do.

Q. You have to make decisions on network quality?

A. Yes.

Q. The strategies that you've told this jury about of how to address internal PIM, find it and fix it, lock it down, PIM-C, have those strategies ever been any different in your time at AT&T?

A. Not that I'm aware of, no.

Q. You've been in the courtroom when there's been a lot of talk about spectrum?

A. Yes.

Q. If AT&T could not use the internal PIM cancellation feature, would it go buy additional spectrum?

A. No.

Q. In your experience, has AT&T ever even considered buying more spectrum in order to deal with this internal PIM issue?

A. No.
Q. Why not?
A. Because, again, if you have internal PIM, the priority would be to identify where the source of it is and fix it. We wouldn't go and add more spectrum to solve that problem.
Q. Now, with respect to the Ericsson radios, those do not have PIM cancellation. Correct?
A. That's correct.
Q. You've been in the courtroom when there was some testimony from a gentleman by the name of Dan Edwards. Correct?
A. Correct.
Q. And I think Mr. Ward even showed you some documents from Dan Edwards yesterday.
A. Yes.
Q. On the -- do you know who Dan Edwards is?
A. Yes, I do.
Q. On the pecking order at AT&T, are you above Dan Edwards?
A. Yes. Mr. Edwards reports to me.
Q. Okay. We saw some documents and some testimony from Mr. Edwards about the Ericsson radios and whether or not he believed PIM cancellation would be good to include in those. You remember that?
A. Yes.
Q. Who makes the ultimate decision at AT&T in that regard?

A. It's me and, you know, others that are at the leadership level make those decisions.
Q. Okay. So with respect to these Ericsson radios, do they contain PIM cancellation?
A. No, they do not.
Q. Do you have any expectation that they are going to in the near future?
A. There is a potential that they'll include it in the future. But, again, it's still to be determined.
Q. The PIM cancellation feature, we saw a document yesterday that said something to the effect of AT&T could expedite its request of Ericsson. Has that happened?
A. No, it has not happened.
Q. Do we continue to buy Ericsson radios?
A. Yes, we do.
Q. Lots of them?
A. Yes.
Q. Without PIM cancellation?
A. Yes.
THE COURT: Mr. Dacus, pull the microphone down a little bit. I don't know why it's sticking straight up there.
MR. DACUS: I don't either, Your Honor, and I apologize. Thank you for reminding me.
THE COURT: Not a problem.
MR. DACUS: Can we pull up PX 269, please?

Q. (BY MR. DACUS) You were here when Mr. Smith testified about this PX 269, which is an email between him and Mr. Chapman who worked at his company related to their reaching out to AT&T? You were here for that, sir?
A. Yes.
Q. Okay.
MR. DACUS: And if we could go to the second page of that, Mr. Horseman and, if you could, the top email, the third paragraph that starts, I've had a long.
Q. (BY MR. DACUS) You remember this is something that Mr. Smith testified about that this gentleman Steve Winsic, I think, on behalf of Finesse said he had a long history with AT&T, he's working with some of his partners to try and bring this technology forward. Do you remember that?
A. Yes.
MR. DACUS: If we could go to the next page, please, Mr. Horseman? I'm sorry, the first page. I apologize. And if you could highlight the bottom email, please?
Q. (BY MR. DACUS) So this is AT&T's response back to Finesse by Mr. -- is it Shively?
A. I believe it's Shively.
Q. By Mr. Shively. And this is what I want to ask you about. He says, "The basic issue that we're seeing third order intermods due to some of the new frequency bands we are using. Using PIM testers and other analysis, we know that the

PIM sources are external to our antenna systems."

Is that consistent with your experience?

A. Yes.

Q. And he says, For example, the sources are rooftop structures, metal parapets, diesel generators, other metal objects. Is that consistent with your experience?

A. Yes, for external PIM.

Q. And then Mr. Shively at AT&T says in response to Finesse, it would help if you could give us a basic explanation of what you have developed. Do you see that?

A. Yes.

MR. DACUS: And so if you could pull that down, Mr. Horseman.

Q. (BY MR. DACUCS) And then if we look at the remainder of those emails, ultimately they make their way to Frank Smith. In October of 2015, he says, Understood. Do you see that?

A. Yes.

Q. Now, as the representative of AT&T, do you have any information or knowledge that anyone at Finesse ever provided us their detailed explanation of how to cure external PIM?

A. I have not seen anything.

Q. Is it your understanding that when Finesse reached out to us, we told them or described for them that our issue was external, not internal PIM?

A. Yes, that's what's in the email.

Q. And is that consistent with your experience?
A. Yes.
Q. But to your knowledge, no one at Finesse ever said here's how we can help you cure external PIM.
A. I am not aware of any documents that indicate that.
MR. DACUS: That's all the questions I have, Your Honor. I pass the witness.
THE COURT: All right. Is there redirect by the Plaintiff?
MR. WARD: Yes, Your Honor.
THE COURT: All right. Proceed with redirect, Mr. Ward.

REDIRECT EXAMINATION

BY MR. WARD:
Q. Good morning, Mr. Loddeke.
A. Good morning.
Q. Let's start off with what you just told Mr. Dacus about Ericsson radios. I want to make sure I understood what you were saying.
Did you say that you don't have any knowledge of Ericsson planning to put PIM-C in its radios going forward?
A. That's not what I said.
Q. And maybe I misunderstood you. Because as recently as August of 2022, you were discussing with Ericsson putting PIM-C in their radios, weren't you?

A. We have had conversations with Ericsson about the potential for PIM-C in upcoming radios.

Q. And in August of last year, it was your understanding that Ericsson radios would have the potential to have that functionality, PIM-C, in them. Correct?

A. Yes.

MR. WARD: And if we could, Mr. Boles, let's look at PX 690. Go to page 3. And let's zoom in on that bottom paragraph.

Q. (BY MR. WARD) Do you recall looking at this document yesterday?

A. Yes.

Q. And the document, Plaintiff's 690, confirms what we've just been talking about, doesn't it?

A. Yes.

Q. Radio-based PIM-C, talking about Ericsson, is now planned for 2022 plus. Correct?

A. Yes.

Q. Which probably means 2023, unless AT&T pushes this as a high priority.

A. Yes.

Q. That's what it says.

A. Yes.

Q. Have you-all not been pushing it as a high priority because you knew that you were coming to trial on this?

A. I don't know that it has to do with the trial. It's -- again, it gets back to the availability of the radio from Ericsson.
Q. But you-all have been asking for that functionality in the radio, have you not?
A. I don't know if it was asked or if it was presented by Ericsson, but it is something that's been discussed with Ericsson, yes.
Q. If the jury has seen documents that indicate that AT&T has been asking for this functionality, would you defer to the documents?
A. Yes. I mean, the documents indicate what they say.
Q. All right.
MR. WARD: Thank you, Mr. Boles.
Q. (BY MR. WARD) Now, looking at Mr. Dacus' chart here, No. 1, can you see it?
A. Yes.
Q. Site hygiene does not equal PIM-C internal. Do you see that?
A. Yes, I see that.
Q. Okay. You would disagree with the statement that internal PIM-C is solved by site hygiene solely. Correct?
A. Give me a second to think about that, or can you repeat that again?
Q. I tell you what, let's look at what's been said about it.

MR. WARD: If we could, Mr. Boles, let's go to the transcript yesterday, page 224, lines 8 to 12.

Q. (BY MR. WARD) This is a question by Mr. Dacus to Doctor Bazelon: "You understand that AT&T's position is and the evidence will be that, for internal PIM, they use site hygiene or maintenance to cure that issue."

Do you see that statement?

A. Yes, I do.

Q. That's not entirely correct, is it, sir?

A. I think for the most part it addresses most of what we do for internal PIM minus the Nokia radios, whatever piece they address.

Q. Right. There is more that AT&T does than just site hygiene or maintenance. Correct?

A. Slightly more, yes.

Q. And I understand it's your position in front of the jury that it's just slightly more, but that slightly more has to do with PIM cancellation in the radios. Correct?

A. Yes.

Q. Because you've told the jury now that PIM-C in the radios does do something to help cancel internal PIM. Correct?

A. Yes.

Q. All right.

MR. WARD: You can take that down, Mr. Boles.

Q. (BY MR. WARD) All right. Let's look at Plaintiff's

Exhibit 611. All right. You talked about this during your examination with Mr. Dacus. Correct?
A. Yes.
Q. This is the grim reaper document. Correct?
A. Yes.
MR. WARD: Next page.
Q. (BY MR. WARD) And the title says, Proposal for External PIM Mitigation and Engineering Design. Right?
A. Yes.
Q. But we can't just look at the title of documents, can we?
A. Not necessarily.
Q. Because there are discussions about internal PIM within this document. Correct?
A. Yes, internal PIM is mentioned.
Q. All right.
MR. WARD: Let's go to the next page. Next page.
Q. (BY MR. WARD) Because on the very page where we see PIM is the grim reaper of compromised design and construction -- do you see that?
A. Yes.
Q. -- the first bullet point is site hygiene. Right?
A. Yes.
Q. And the next bullet point is power reduction of offending sectors.
A. Yes.

Q. And that's turning the power down.
A. That's correct.
Q. And when you turn the power down, you're addressing internal PIM. Correct?
A. I wouldn't completely agree with that.
Q. Okay. Is that one of the things you can do to address internal PIM is to turn the power down?
A. I don't believe that's typically done.
Q. Okay.
MR. WARD: Let's go to the next page.
Q. (BY MR. WARD) We talked about this yesterday, but I just want to make sure that I understood your testimony, because when talking about PIM, the bullet point 3 says, "We have so many channels of our own in the network, it is becoming more and more difficult to avoid these newer third order conflicts."
Now, did you agree with me that that's internal PIM?
A. It doesn't have to be internal PIM.
Q. Can it be internal PIM?
A. Yes, it can be internal.
Q. All right.
MR. WARD: Let's go to the next page.
Q. (BY MR. WARD) Because, "Today's issues --"
MR. WARD: Blow that up, Mr. Boles.
Q. (BY MR. WARD) "-- signals that fall in this area do

impact the footprint of the cell by limiting the receiver's ability to hear the mobiles. A 6 decibel increase in noise reduces the footprint by 50 percent."

Do you remember looking at that?

A. Yes.

Q. All right.

MR. WARD: Zoom back out.

Q. (BY MR. WARD) And because what's pointing to it is this third order PIM.

A. Yes.

Q. Right? And the third order is what we were talking about in that third bullet point on the previous page. Correct?

A. Yes, we were.

MR. WARD: All right. You can take that one down, Mr. Boles. I want to look at another one, Plaintiff's Exhibit 646.

Q. (BY MR. WARD) All right. This is talking about B14 PIM impact to B17 mitigation, and these are talking about bands that are close to one another. Is that correct?

A. Yes. They're both 700 megahertz bands.

Q. Okay. And what I want to focus on is the first line of this email. It's from someone named Jason. Do you know Jason Carter at AT&T?

A. Yes.

Q. Okay. So it's being written to Mr. Carter, and it says,

The increase in noise due to PIM is inevitable based on the frequency plan in AT&T.

Are you familiar with AT&T's frequency plan and its acquisitions?

A. Yes, I am.

Q. And when we talk about frequency plan and acquisitions, we're talking about the way that AT&T buys its spectrum. Correct?

A. Correct.

Q. And would you agree with me that the way that AT&T has purchased its spectrum has exacerbated the problems of internal PIM?

A. I don't know if I could completely agree to the way that question is phrased.

Q. Okay. Would you agree with me that no amount of site hygiene is going to address the inevitable problems that arise with the way that AT&T is purchasing spectrum?

A. There is always a chance for some amount of internal PIM when something's broke.

Q. Well, but there's also a chance of internal PIM when you start putting your bands close together in a tri-band radio. Correct?

A. Again, if something is broke, yes.

Q. Only if it's broken. Is that your testimony now, that only when the radio is broken is when you're going to have

internal PIM?
A. I didn't say the radio being broke. You would have to have something in that feed line path.
Q. Okay. So is it your testimony before the jury that the only time you're going to have internal PIM is when there is a problem with some of the connections or a broken coax cable? Is that when you have internal PIM?
A. I would say that that -- the point you would have internal PIM that is measurable and impactful, yes.
Q. And so it's your testimony that bands 12, 14, and 29 being located together in a tri-band radio does not cause internal PIM?
A. Again, the specifics of whether or not it would in the radio itself, I would defer to Nokia. But, again, assuming everything works as it's supposed to, we should not have an issue.
Q. Would you defer to AT&T's documents that were generated before this case?
A. We can look at those documents and see what the opinions are.
Q. Well, I understand you might have opinions about them. But if there are documents that the jury has seen, would you defer to those documents or do you disagree with AT&T's own documents?
A. No, I would say we would have to look at the documents

and see if that's an opinion of an individual.

Q. All right.

MR. WARD: Let's look at PX 674.

Q. (BY MR. WARD) And this is from Mr. Edwards. And you're above him in the pecking order. Right?

A. Yes, I am.

Q. Are you more experienced than he is?

A. We both have experience in different areas.

Q. And the subject of this one is PIM mitigation. And this is from March of 2021. Right?

A. Yes.

Q. And the first bullet point is, decision to develop the Nokia tri-band radio with PIM cancellation. Do you see that?

A. Yes, I do.

Q. And he says, I realized that the markets do not do enough engineering as to isolation between antenna. Do you see that?

A. Yes.

Q. "And the spectrum group does not evaluate the mixing of existing frequencies with new opportunities." Do you see that?

A. Yes.

Q. So is Mr. Edwards not saying that when you mix frequencies, you develop internal PIM?

A. I believe he's indicating that with incremental spectrum, there's always the potential for PIM products.

Q. Right. Because the very point that he is addressing is the decision to develop Nokia tri-band radios with PIM cancellation. Correct?
A. It's -- he states -- again, what he states there relative to the -- he believes that they don't evaluate that. That's his opinion.
Q. That's his opinion.
A. Yeah.
Q. "And, therefore, the need for a remote radio head that does as much as possible as to eliminate or control PIM." That's what Mr. Edwards says. Correct?
A. Yes, that's what he says.
Q. Is he a competent engineer --
A. Yes.
Q. -- or is he incompetent?
A. He is a very competent engineer.
Q. And then "radio frequency power levels of B14 and B29 in Ericsson markets." Right?
A. Yes.
Q. All three bands interact with each. That's what's written in the email. Correct?
A. Yes.
Q. And then "radio frequency power levels of B14 and B29 in New York. The one thing that you should consider is not only power level but overall thru-put and the amount of PIM hits."

Correct?
A. Yes.
Q. "Different markets have different spectrum and the total number of PIM hits can largely vary between them." Correct?
A. Yes.
Q. And you're saying that the way that AT&T buys its spectrum is not compounding the PIM problem for mixing frequencies.
A. Again, I think there is -- again, I can't completely agree with the statement.
Q. Were you finished?
A. Yes.
MR. WARD: Let's look at PX 708R.
Q. (BY MR. WARD) Another email from Mr. Edwards. Right?
A. Yes.
Q. And you're copied on this one. Right?
A. Yes, I am.
MR. WARD: Let's go to the next page.
Q. (BY MR. WARD) "Competitor pressures mandate AT&T site efficiency AT&T site concept 2021 plus Nokia."
MR. WARD: Next page. Let's go to the next page.
Q. (BY MR. WARD) "AT&T's fragmented spectrum causes cost and complexity."
Is that what is attached to Mr. Edwards' email?
A. Again, I'm not -- assuming this document is associated

with the email, then I would have to assume that is the case. But that's what's on the slide here, yes.

Q. I'll represent this is what was attached to the email.

A. Yeah. Okay. Yes. I'm sorry.

Q. Okay. So at least in Mr. Edwards' mind, the way that AT&T is going about purchasing its spectrum causes costs and complexity. Correct?

A. Yes, that's what he states.

Q. And we just saw the previous email where he's talking about these problems being inevitable when you put 12, 14, and band 29 in one radio. That's what he says. You don't have to agree, but at least that's what Mr. Edwards says. Correct?

A. Yes.

MR. WARD: You can take that down.

Q. (BY MR. WARD) Now, do you understand that in this case that it's not Finesse's position that AT&T would go purchase more spectrum to address PIM? Do you understand that's not our position?

A. I'm not sure what your position is on it, so...

Q. Okay. Maybe you weren't listening to Doctor Bazelon. Didn't he testify that the damages are calculated based upon the spectrum that we are able to salvage using PIM-C?

A. Yes, that's what he stated.

Q. Right. It's spectrum that you already own, it's those lanes of traffic that are clogged that you already own that

are being opened up for additional usage. That's what he said. Correct?
A. Yes, that's what he said.
Q. Now, you showed us how you keep track of your internal PIM and external PIM costs. That was the Excel spreadsheet we were looking at?
A. Yeah. That spreadsheet focused more on internal.
Q. Okay. And I think you told the jury that for PIM-C and these radios, you don't even think you pay for it.
A. No, I said I don't know that it's accounted for in the radio price, but there were features in the software buyout.
Q. Okay. It's not free, is it?
A. I'm sure there was some cost to it for us from Nokia, but I don't -- there's -- I don't know what the specific cost was.
Q. We've talked a little bit about ExxonMobil drilling for oil. You heard those comments?
A. Yes, I did.
Q. Now, if ExxonMobil didn't have to pay for the oil that it purchased, it could make a bigger profit, couldn't it? When it sells its gas, if it wouldn't have to pay for the property it was using, it could sell it and make a better profit, couldn't it?
A. Yes, they would be able to.
Q. That would be a great deal for everybody. Right? We'd have lower gas prices; Exxon would have more profits?

A. It's hard to say if it's a better deal for everybody.
Q. Yeah. The property owner is not getting a very good deal, is he?
A. Not in that scenario.
MR. WARD: Pass the witness.
THE COURT: All right. Is there further cross examination?
MR. DACUS: Yes, Your Honor.
THE COURT: Let's proceed with additional cross.
MR. DACUS: Thank you, Your Honor.

RECROSS EXAMINATION

BY MR. DACUS:
Q. With respect to internal PIM, it's created by defects in what? I want to be specific with the jury.
A. Yeah. It's something within that antenna feed line path. So radio, the connectors, the coaxial cable itself that's from the radio to the antenna, or from the antenna itself.
MR. DACUS: Can we pull up demonstrative Exhibit No. 1, please, Mr. Horseman?
Q. (BY MR. DACUS) So you recognize this as the tower that you showed the jury earlier?
A. Yes, I do.
Q. So between the antennas and the radios, what connects those things?
A. It's a coaxial cable. So think of the -- it's thicker

than what you use at your home between your kind of TV if you have cable in your house, but it's the same concept.

Q. And there are connectors sometimes connecting those cables?

A. Yes.

Q. And so the internal PIM that we're talking about is somewhere in this cabling and connectors here?

A. Yes.

Q. And is that why it's easier to find?

A. Yes.

Q. Is that why it's correctable by sending a repairman or performing hygiene?

A. Yes.

MR. DACUS: That's all the questions I have, Your Honor. I pass the witness.

THE COURT: All right. Is there additional direct?

MR. WARD: No, Your Honor.

THE COURT: All right. You may step down, Mr. Loddeke.

Ladies and gentlemen, you've had an unanticipated break this morning, but the rest of us haven't. So we're going to take a short recess for just a minute.

You can simply leave your notebooks closed in your chairs. Follow all my instructions. We'll try to make this short, and we'll be back to proceed after that.

The jury's excused for recess.

(Whereupon, the jury left the courtroom.)

THE COURT: Court stands in recess.

(Brief recess.)

THE COURT: Be seated, please.

Mr. Grinstein, is Plaintiff still prepared to rest at this juncture?

MR. GRINSTEIN: We are, Your Honor.

THE COURT: Let me bring in the jury, and I'll get that announcement on the record.

Let's bring in the jury, Mr. Turner.

(Whereupon, the jury entered the courtroom.)

THE COURT: Please be seated, ladies and gentlemen.

Plaintiff, call your next witness.

MR. GRINSTEIN: Your Honor, Plaintiff rests.

THE COURT: All right. The Plaintiff has rested its case in chief. We'll transition and proceed to the case in chief presented by AT&T and Nokia.

Mr. Nelson, call your first witness.

MR. NELSON: Thank you, Your Honor.

Your Honor, at this point AT&T and Nokia would like to call Mr. Mike Taylor to the stand.

THE COURT: All right. Mr. Taylor, if you'll come forward and be sworn, please. Any way you can get here.

(Whereupon, the oath was administered by the Clerk.)

THE COURT: Please come around, have a seat at the witness stand.

Are there binders to distribute?

MR. NELSON: There are.

THE COURT: Let's do that.

MR. NELSON: Thank you.

THE COURT: Mr. Taylor, if you'd like to pour yourself some water before we get started, this would be a good time to do that.

Mr. Nelson, you may proceed with direct examination.

MR. NELSON: Thank you, Your Honor.

MIKE TAYLOR SWORN,

testified under oath as follows:

DIRECT EXAMINATION

BY MR. NELSON:

Q. Sir, could you please introduce yourself to the jury?

A. Yes. My name is Mike Taylor.

Q. Mr. Taylor, can you tell us what you do, what your job is?

A. I am an engineer at AT&T.

Q. And what do you do as an engineer? What's your job responsibility as an engineer at AT&T?

A. I am a radio frequency engineer, so I deal with many aspects of the network in terms of performance, specifically on the radio side of things.

Q. Do you deal with anything regarding interference of RF signals?
A. Yes, I do.
Q. And can you just tell us generally what kind of things you do there?
A. Well, interference can affect the performance of the network so -- there are a lot of different types of interference. So I deal with, you know, the effects of interference and types of interference, what do we do to, you know, find and fix them, things like that.
Q. So how long have you been in this role, you know, locating and mitigating interference at AT&T?
A. Since I joined AT&T about 12 years ago.
Q. And what kinds of things did you do before that?
A. I started out in the industry in 1984. And since then, I've always been involved in the radio frequency engineering side of the cellular business, so anywhere from designing radios and transmitters and antennas to designing whole systems, to modeling systems and software, kind of soup-to-nuts RF engineering design for cellular networks.
Q. And what are some of the other companies where you've worked, sir?
A. When I got out of school, I first worked at Motorola who at the time was very big into, you know, base stations and also some of the first handsets that were quite popular back

then.
Q. And anywhere else besides Motorola and AT&T?
A. Yes. I've worked for a couple of consulting firms consulting to, you know, companies like AT&T and other operators, and also for a private engineering firm on a couple of occasions.
Q. And did that involve RF type things like we talked about?
A. Yes. I've been involved in RF exclusively since 1984.
Q. And remind us, I might not have done this, RF stands for what?
A. Radio frequency.
Q. Now, your education. Can you tell us about that?
A. Yes. I graduated from the University of Wisconsin in 1984 with a Bachelor of Science in electrical engineering.
Q. And so then how many years total is your experience with radio frequency and interference in general?
A. I guess I'm coming up on 39 years in the industry.
Q. Now, have you ever heard the term PIM, or passive intermodulation?
A. Yes, I have.
Q. Do your job responsibilities at AT&T have anything to do with PIM?
A. Yes. Yes, they do.
Q. And can you tell us what those are, please?
A. I am -- for the -- our headquarters' engineering team, I

am the subject matter expert on -- on PIM on intermodulation.
Q. So subject matter expert. Can you tell us what that means?
A. Yeah. So we have subject matter experts in all sorts of different, you know, aspects, of course, of engineering. And so it's really -- I'm kind of like the go-to guy, the -- it's my responsibility to understand and, you know, kind of all aspects of PIM and educate our engineers and kind of, you know, A to Z everything about PIM.
Q. So how much of your job now, let's -- it's 2023 now. How much of your job now is devoted to dealing with PIM detection and mitigation issues?
A. At least 95 percent, I would say.
Q. And has that always been the case?
A. It varies. Since I joined AT&T, anywhere from, you know, 30 percent from my initial role up until the last probably four years, it's been almost exclusively dealing with PIM.
Q. Now, is anyone else at AT&T devoted basically full-time like you described to dealing with PIM issues?
A. No.
Q. So you're a PIM guy?
A. I'm the PIM guy.
Q. In your job at AT&T, are there different kinds of causes of PIM that you deal with?
A. Yeah. We always separate them into kind of two big

categories. One is external PIM, and the other is internal PIM.

Q. Okay. So can you explain to us just generally what you mean by external PIM?

A. External PIM is PIM that's caused by -- PIM is always caused by an object some place, you know, some non-linear. Anyway, external PIM is -- it's caused by something not connected directly to the radio. So it can be an air conditioner or, you know, anything out in front or behind the antenna but not connected to the antenna.

Q. So something outside the antenna in the air?

A. Correct, yes.

Q. Okay. And then how about internal PIM? You referred to that.

A. Internal PIM involves anything that's directly connected to the radio. So it can be the radio itself. It can be -- the radio is always connected to the antenna via a piece of coax, so it can be in the coax, in the connectors, or in the antenna itself.

Q. So, sir, do you have some estimate of the time split in your job at AT&T between your work on internal PIM versus external PIM?

A. Yes, I spend at least -- of the time I spend on PIM, I spend at least 95 percent of my time on external PIM.

Q. And why is it that you spend so much time on external PIM

versus internal PIM?
A. Well, there's -- there's a couple of reasons. The first is that external PIM is much more prevalent than internal PIM in the network.
The second is that external PIM is much harder to find and fix. It takes a higher skill level. It's not always fixable. So whereas like with internal PIM you can always -- you can always find it, you can always fix it, and it's -- there's really not that many possibilities for what's causing it.
Q. So, sir, have you prepared a demonstrative to kind of show us this difference between internal and external PIM?
A. Yes. Yes, I have.
MR. NELSON: And, Mr. Horseman, can we pull that up?
Q. (BY MR. NELSON) So this is DDX 3, Defendants' Demonstrative Exhibit 3. So can you show us what you're depicting here, sir? Or explain to us, rather.
A. Yes. Okay. So can I point on here?
Q. If you pull up -- so if you hit the upper right side, you'll see an arrow come up, and then --
A. Oh, yeah. Let me try that here.
Q. And you can get the pencil.
A. The pencil. There we go. Okay. So this right here is the radio, and then each radio is connected to multiple antennas. So in this case we have four antennas right here,

here, here, and here. And these red lines are the -- the coax or the feed line that are connecting the radios to the antennas.

And in this case this is demonstrating external PIM where the -- the transmit signals that are coming out of each of these antennas are hitting -- in this case it's a sign, and PIM is created here.

And PIM is another -- another radio signal that's generated. Right? So there's actually a brand new radio signal generated right here. And that is then radiated or transmitted back into these antennas and down these four feed lines back into the radio. And then that's the interference that the radio sees.

So in the case of external PIM, what we see here is that all four, what we call, receive branches, you can kind of think of them as ears, like all of the individual ears of the radio are all affected by external PIM.

Q. So, sir, now do you have a demonstrative that -- where you demonstrate internal PIM and what -- what that would be?

A. Yes. Okay.

Q. So now this would be page 2 of Defendant Demonstrative Exhibit 3, and can you explain to us what you're showing here?

A. Yes. So in this case, again we have the four antennas, the radio, the four feed lines, except in this case there is internal PIM created in one of the -- one of the receive

branches due to a defective -- in this case it's a connector. So there's a connector here that, you know, has failed or something like that.

And so now the interfering PIM signal is created in this feed line, and then it goes back down the feed line into the radio. So in this case the PIM is really only affecting one of the multiple receive branches of the receiver.

Q. So what about the other three branches of the receive branches of the receiver?

A. The other three aren't affected because the fault is only directly in line with the one receive branch.

Q. So if there are no faults in the lines, the connections, or the antenna, do you in your job at AT&T see internal PIM issues?

A. No, we don't.

Q. And why is that?

A. Well, the big reason is that -- so the engineering side of things is when we -- every one of these components has a specification for PIM--the antennas, the connectors, everything like that. And so when we set those specifications, it's done such that if everything is working properly, that there is no -- there is no measurable PIM.

Q. And what do you mean when you say, no measurable PIM?

A. Well, there's always PIM to some level. But the key is it's -- it just has to be low enough so that we don't see it

underneath -- there's -- there's always noise in a radio. It's the static like that you hear when you turn on, especially anyone used to old AM radios or something like that. You turn it on and you'd have static, and that's -- that's the noise that's always there.

So as long as the PIM is down below the level of that noise, it makes no -- has no effect on the performance.

Q. Could you even see that it was there?

A. No. No. You can't see it because the static basically is -- is stronger than the PIM.

Q. So how is it then when the radios are installed, you go out to the -- the cell towers and you install the radios, that AT&T ensures there's none of this internal PIM?

A. Well, we have tests that we run, and -- to -- so after a crew goes out and installs a new radio or builds a new cell site, one of the things we do is we test to make sure that there isn't any defect as part of the build. You know, make sure they tighten all the connectors properly and things like that.

And so we have a test that we can run that creates the worst case conditions for PIM. And then we look to see if -- if there's any PIM there.

Q. Now, if everything -- well, let me ask you this question first. So does AT&T accept an installation until those tests are run?

A. No. No, we don't.

Q. And why is that?

A. Well, because it's always fixable. And so all of -- all of that work is done by other vendors for AT&T. And so before they can get paid, they have to show us that there's no PIM.

Q. Would AT&T accept the work of the vendors and pay them before the tests are run to ensure there's no internal PIM?

A. No, we would not.

Q. And why -- just explain to us why that's the case.

A. Well, because you know, they're -- you know, they agree to do the work and deliver a PIM-free installation to us. And that's just part of our contract with them.

Q. So the -- you're familiar with Nokia dual band radios in the network. Right?

A. Yes. Yes, I am.

Q. And are you familiar that there's some tri-band radios in the network?

A. Yes. Yes, I am.

Q. So, sir, at installation, would you see internal PIM problems just because you're using those dual or tri-band radios?

A. No. It doesn't really matter. Every radio in our network is -- will have no measurable PIM as long as there aren't any defects built, you know, during the time of construction.

Q. So would just by virtue of the fact that you're using, say, bands 12 and 14 and 29, would you necessarily have PIM, internal PIM issues at installation?
A. No. No, we wouldn't.
Q. Why is that the case?
A. Well, it goes back to the, you know, the way we spec out the components for PIM. So, you know, there's a lot of math behind it, but basically if everything is built according to spec and -- and all of the -- the products meet all of the specs that we impose on the manufacturers, that we just won't have any measurable PIM.
Q. So now I'd like to go back to external PIM. So which is worse in terms of the effect? Is it external PIM or internal PIM?
A. External PIM is by far, you know, has a worse effect on the -- on the network.
Q. And can you explain to us why that's the case?
A. Yeah. There's really two reasons. You know, first of all, like I said, it's just more prevalent so it happens more often. And then when it does happen, because it's affecting all of the receive branches or, you know, all the ears of the radio, it has a much more harmful effect than when only one of the receive branches is affected, which is what is the case with internal PIM.
MR. NELSON: So if, Mr. Horseman, if we could pull

the demonstrative back up, DDX 3, this is.

Q. (BY MR. NELSON) So can you explain why it is that, using this demonstrative DDX 3, why external PIM would have a worse effect on the performance of a network?

A. Yes, because, you know, recall that the PIM source is external out here on this sign. I can point there. There we go. And so this signal is radiated out and is received by all of the antennas. So all four of the receive branches of the radio are compromised by PIM.

Q. And if we go to the next of the internal PIM, can you explain to us why internal PIM would have a lesser effect?

A. Yes, because only -- only one of the receive branches is affected. So the other three are working perfectly fine and we have valid receive information on all -- on the other three lines.

Q. So is it -- if the internal PIM issue, in this case it's on the top one, the red branch, receive branch --

A. Yes.

Q. -- if it got bad, what could you do?

A. Well, our two primary kind of tools in the toolbox are -- the most desirable thing is just to fix it. Right? Because it's always -- it's always the case that if it's broken, it can be fixed. So send a crew out to fix it.

The second thing that we can do is we can actually disable the -- the receive branch that is affected. So we can

essentially remotely in software just turn it off and ignore it.

Q. And how long would that take?

A. A half a minute or a minute. I mean, however long it takes you to open up a computer and enter a command in.

Q. So if you shut down in this case the red receive branch, would that have a material effect on the throughput, meaning how many calls and stuff you could receive?

A. It might have a slight effect but nothing major.

Q. And when you say slight effect, what do you mean?

A. In terms of the overall performance, it might affect throughput to a very small degree.

Q. Now, so on that throughput point, how often in your experience would the cell towers actually be operated at a hundred percent capacity?

A. It's pretty rare actually.

Q. Now, sir, have you in connection with your job at AT&T done any studies or has AT&T done any studies regarding the effects of external PIM?

A. Yes. Yes, we have.

Q. Okay. And are you familiar with the study in the Los Angeles area of external PIM?

A. Yes. That's a study that I conducted.

Q. Okay. So you conducted that. And what was the purpose of that?

A. The main purpose of that was to assess the effectiveness of some of our baseband PIM mitigation products on PIM.
Q. Now, when you say baseband PIM mitigation products, is that the Nokia dual and tri-band radios with the PIM-C in the radio?
A. No, it's not.
Q. Okay. Well, have you ever heard of something called P614?
A. Yes, I have.
Q. So in this Los Angeles study on external PIM that you were talking about, did that involve the P614?
A. Yes. Yes, it did.
Q. So what is the P614?
A. So the P614 is an Ericsson product that we use in the Ericsson part of our network, and the purpose of that is to mitigate external PIM.
Q. So would the data from this LA study involving the P614 product for external PIM on performance be relevant to the effects of internal PIM in the AT&T network?
A. No, it would not.
Q. And can you tell us why that's the case?
A. Well, it goes back to, you know, the difference between internal and external PIM where with internal PIM you're only affecting one of the receive branches. So the effect on performance is minor, whereas with external PIM, since it's

affecting all four receive branches, you know, the same level of PIM has a much more detrimental effect because, you know, all of your ears or all the receive branches are now being affected.

Q. So, sir, now I'd like to go to an exhibit, PX 664, please.

MR. NELSON: If you could pull that up, Mr. Horseman.

Q. (BY MR. NELSON) And you'll see here there's a cover email from yourself to a number of gentlemen at AT&T. Do you see that?

A. Yes. Yes, I do.

Q. So are you familiar with this document?

A. Yes, I am.

Q. And was there -- it says, "A deck that I put together for today's call is attached." Do you see that?

A. Yes.

Q. And is there a deck attached that you had prepared?

A. Yes, there was.

Q. And a deck meaning like a slide presentation?

A. Yep. Yeah. That's what we call them a lot, yes--decks.

MR. NELSON: So, Mr. Horseman, if we could go to the second page of the attachment.

Q. (BY MR. NELSON) Now, here the title is Ericsson Internal PIM Diagram. Do you see that?

A. Yes.
Q. So what were you depicting here?
A. So this is a little more involved kind of engineering sort of drawing. But basically what it's really depicting is the blue here is -- is the transmit frequency. So on the horizontal scale, picture that as like the FM radio dial, you know, that a lot of us are familiar with. And on this frequency we're transmitting. So that's, you know, the information going from the base station down to the -- down to the, you know, your handset. And then the handset is transmitting back over here in this green.
And what this is showing is that you can have what we call self-PIM. So when you have a single band radio, you can have PIM that's centered here. So this yellow is -- is the PIM itself. Right? That's what it kind of looks like. And the part of this that falls on top of the green where we're listening is right here. That's the level of PIM interference, a relative level of PIM interference.
Q. So in the diagram that you just talked about, would you see any measurable PIM if there was nothing broken in the line that you talked about?
A. No, no. And it's because if -- we talked about the noise. Right? The thermal noise or the static. Right? And, you know, that level might be, say, up here. Right? So as long as this level is lower than that, it's indetectable.

Q. So then are you showing here what would happen -- what would be the case if, in fact, there were internal PIM effects in the -- with that particular radio?

A. Well, like with this particular radio, we know that this level of PIM that's there is so far below the -- kind of the static, that you can never detect it and it won't have any effect.

Q. And would you even see what you've depicted here if there's nothing broken in the line?

A. No. It's impossible to ascertain anything.

MR. NELSON: So if we can look now at the next slide of this presentation.

Q. (BY MR. NELSON) And here you show the Nokia AHLBA dual band internal PIM diagram. Do you see that?

A. Yes, I do.

Q. Okay. So now can you explain to us what you're showing here on the third page of this presentation?

A. Yes. So it's a little more involved, but PIM can be caused by multiple signals, you know, together creating PIM. And so we have the transmit from band 17 and band 14. And when they combine to form third order PIM, it looks kind of like this -- this red trapezoid here. So you can see that we have the yellow one we talked about previously under here, and then we have this energy here. And that would be the PIM from -- from the dual band -- from the two transmits of the

dual band.
Q. Now, sir, would you see that PIM in -- in the network with the Nokia dual band radio that you show here if there was no defects in the feed, you know, for -- to the antenna?
A. No. And visually, you know, again, if, you know, if -- all the components are picked and are spec'd out and things like that such that, again, if this is the thermal -- this is all a relative diagram. Right? There are no units on it.
So if -- if you -- this line I drew here would represent the -- the static or the thermal noise, and so under normal situations it's still weaker than the noise that's naturally present in the system.
Q. So then I'd like to go look at a few of the bullets there. And if you look down at the red highlighted -- not highlighted -- yeah, now it's highlighted. It says here, Nokia RRH PIM cancellation needed to reduce expected higher internal PIM versus single band RRH. Do you see that?
A. Yes.
Q. Okay. So what were you talking about here?
A. So really what -- the point of this whole deck was to compare, you know, what if Ericsson would also introduce a radio with a similar band combination, you know, this dual band or tri-band combination. And really what it's saying there is to get the same PIM performance, that the PIM

cancellation would give us the same performance as we have for the -- for the Nokia product.

Q. Now, just to be clear, if the network was -- had no internal PIM issues, you know, it was installed properly, working properly, would you -- with the Nokia dual band radios, would you have PIM interference?

A. No. No, we wouldn't.

Q. Okay. And why is that?

A. Well, it goes back to again the design. All of the components in -- that we use in the network are -- are specified so that if everything's working properly, the PIM level is below the -- the naturally occurring noise in the network.

Q. So if --

MR. NELSON: We can put that -- yeah. And now let's go to that first bullet there.

Q. (BY MR. NELSON) Internal PIM products much stronger than single band Ericsson due to direct third order hits on B14 and 17 RX. Do you see that?

A. Yes.

Q. Okay. Can you tell us what you mean -- what you referred to there, rather?

A. Yes. That's just kind of putting into words the fact that this red, you know, PIM signal is stronger than -- than the yellow one that's there, if you only had a single band

radio.
Q. Now, I got a question for you. So does AT&T buy any radios from Ericsson that have dual band?
A. Yes.
Q. And are -- would any of those Ericsson radios have a similar diagram that you show here with the red trapezoid?
A. With -- with the third order PIM from like multiple --
Q. Yeah.
A. Yes. Yes, they do.
Q. And what are those radios?
A. I can't remember the exact model number, but they're -- they're used in our -- what we call our mid band, mid bands, which is PCS and band 66.
Q. And are those deployed in the AT&T network?
A. Yes. Yes, they are.
Q. And do those radios, the Ericsson radios now, the dual bands that we just talked about, do they have an internal PIM-C feature?
A. No. No, they don't.
Q. And how do they work in the network?
A. They work fine just like any of our other radios.
Q. Okay. So then is the PIM-C feature necessary in order for the dual or tri-band radios to perform in the AT&T network?
A. No, it's not necessary. It can be helpful at times, but

it's not necessary.
Q. So let's talk about that then. So it can be helpful sometimes.
A. Yeah, correct.
Q. What do you mean by that?
A. Well, what I mean by that is it's -- you can look at it as another tool in our toolbox. Right? We have -- we can simply fix the -- the problem, we can turn off the bad receive leg. And in cases where -- where PIM is causing an issue, it might reduce PIM in some cases and let us, for instance, delay having to go out and -- and send a crew out to -- to fix the problem.
Q. Okay. So then what benefit would be there? You say delay. I assume when you say delay, you mean that it can't be delayed forever?
A. Yeah. A lot of times it -- you know, it -- sometimes it can be delayed forever, sometimes it can't.
Q. Okay. So, now, are there times where the crews are going out to the towers anyway to do installations or what have you?
A. Oh, yeah. We've -- they're out on sites every day.
Q. About how often would the crews be hitting the towers anyway?
A. An individual tower? It's hard to say exactly. Every, you know, one to two or three years, just depending on what's going on with that particular site.

Q. And if you were seeing an internal PIM issue at that particular tower, what would happen with respect to that crew going out for installation?
A. Well, they could fix it while they're out there doing other work, for example.
Q. Now, is that something that AT&T does?
A. Yes.
Q. Okay. Now, turning back to the document here that's PX 664, I believe, the PIM that you're depicting here, if there's nothing broken in the line, so the line and the antenna are as spec'd, would you see the PIM effects in the dual and tri-band radios whether they're Ericsson or Nokia radios?
A. No, you would not.
Q. And explain to us why that's the case.
A. Well, it's -- it's because it's -- it's below the level that's detectable because it's -- it's weaker than the naturally occurring noise, the thermal noise, in the -- in the -- any -- in all the radios.
Q. So then to have an internal PIM issue, does something need to be broken?
A. Yes.
Q. So do you have an idea, and your job is, you told us, almost 95 percent of your time as the PIM guy, do you know if that's a common occurrence that something's broken in the feed line that would cause an internal PIM problem with the radio?

A. It's -- it's relatively uncommon.
Q. And have you collected any data to indicate that? Is that something that you have access to?
A. Yes.
Q. And what is it that you generally learn from that data?
A. That it's infrequent. It's an infrequent problem.
MR. NELSON: So I'd like to go to DX 274, the next exhibit, Mr. Horseman.
Q. (BY MR. NELSON) So did you prepare a summary of the data that we just talked about?
A. Yes. Yes, I did.
Q. Okay. And can you tell us where this data came from?
A. Yeah. This is a snapshot of the -- all of the Nokia dual and tri-band radios in the network on, I believe it was, June 9th. And so this is data that was, you know, primarily designed to measure how often PIM occurs in radios that have PIM-C on and then PIM-C off, for the dual band radios.
Q. So this is all the data for all of the Nokia dual band and tri-band radios in your network?
A. It's all the dual and tri-band 700 -- just the 700 band. There's dual band radios that are up in the PCS band as well.
Q. Understood. Okay. So -- but at least the radios that are accused of infringement in this case. Right?
A. Yes.
Q. Okay. So you said it's from June 29th?

A. I think it was June 9th of 2022?
Q. June 9th of 2022. So could you go in on any other day and collect the same data?
A. Yes.
Q. Okay. Now, would you expect -- let's just pick February 6th. If you went in on February 6th of 2023, would you expect the data to be any different?
MR. WARD: Objection, Your Honor; calls for speculation.
THE COURT: It does. This is one of those witnesses who is designated by declaration as an expert. I assume this may go beyond the scope of his declaration?
MR. NELSON: I don't believe so.
MR. WARD: Your Honor, I think it's --
THE COURT: If it's within the scope of his declaration, he's entitled to offer an opinion.
MR. NELSON: How about if I lay the foundation for his knowledge with a couple of more questions.
THE COURT: I'll allow you to restate the question.
MR. NELSON: Okay.
THE COURT: And then if we need to take this back up, we will.
MR. WARD: Okay.
Q. (BY MR. NELSON) So the PIM problems, internal PIM issues in a network, do those change from day-to-day based on your

experience?
A. Very little.
Q. And why is that? Can you explain to us why that's the case?
A. Well, when something is broken, it's broken until it's fixed. So, you know, it doesn't vary a lot from day to day to day because this -- you know, it takes a while to fix radios and things like that. So, you know, in -- in general, you know, networks statistics don't vary much from day to day.
Q. So now if we look back at DX 274 --
A. Yes.
Q. -- and you'll see that first line says number of radio channels?
A. Yes.
Q. Can you tell us what that is?
A. So that's in -- in the study, that's all of the radio channels that were involved in the network and -- or involved in the study. So there's 67,000 and change that had PIM on and 3,000 that had the PIM-C feature off.
Q. So do you understand why some of them would have the PIM-C feature off?
A. I don't know exactly why each individual one had the feature off, no.
Q. So when you talked about the installation, when the folks go out and install the radios and do the testing to make sure

there's no internal PIM, even though there's no internal PIM, do you still -- is it AT&T's policy to go ahead and enable the PIM-C?

A. Yes.

Q. Okay. And why is that?

A. It might help and it doesn't hurt, so we might as well turn it on.

Q. So let's look at some of the other data here. So the next line, it says, the number internal PIM detected. Do you see that?

A. Yes.

Q. Now, can you explain to us what that is?

A. So, yeah. We have ways of -- of --some algorithms that I developed that allows us to detect if PIM is present, and if so, is it internal or external. So of the -- for instance, of the 67,159 radios with PIM-C on, we detected PIM in 988 of them. And in the 3,026 channels with PIM-C off, we detected PIM in 60 of them in internal PIM.

Q. So then if we go to the next line, it says percent internal PIM detected.

A. Yes.

Q. And I mean, first of all, detected, does that mean that it actually affects the operation of the network?

A. No.

Q. Okay. So explain to us what detected means.

A. Detected just means we have -- we can see that PIM might be present. So it's a pretty conservative detection algorithm. And so this just says that we think PIM might be present but doesn't make any judgment about if it -- if it affects performance or not because many times what we see with internal PIM is, even though we can detect it, it has no effect on performance.

Q. So just to be clear, what we're looking at here in DX 274 was a study specifically with respect to internal PIM. Is that right?

A. That's correct.

Q. And so the data here doesn't deal with external PIM. Is that correct?

A. That's correct, yes.

Q. So now the percent -- let's look at PIM-C on.

A. Okay.

Q. And what's the percentage there of -- where radio channels where PIM-C -- excuse me, where PIM was detected at all?

A. Yes. So that's rounding to about -- it's about one and a half percent of the channels with PIM-C on had detectable internal PIM.

Q. And how about with PIM-C off?

A. That was rounding, again, to about 2 percent.

Q. Now, it says radio channels here.

A. Yes.
Q. Is the number of radio channels equal to the number of radios?
A. No, it's not.
Q. Can you explain to us why not?
A. Yes. Because remember these are -- most of these are dual band radios -- well, they are all dual band radios. And in most of those dual band radios, we have two channels and sometimes three but usually two channels, band 14 and band 17. So on average, it's about two radio channels per radio in this study, approximately.
Q. Now, the next line in the summary, it says, number with internal PIM and KPIs impacted. Do you see that?
A. Yes.
Q. Okay. So can you tell us what it means to have KPIs impacted?
A. Yes. So KPIs -- I know we're all used to using, you know, terms like that that probably aren't clear, but KPI is key performance indicator. So that's a class of -- of -- of data or statistics that we pull from the network that allows us to get an idea of how well it's performing.
So what this is saying is that when we had internal PIM, how many of these do we think that the KPIs might be impacted due to PIM.
Q. And what's the -- with PIM-C on, what's the percentage of

radio channels where it had internal PIM and KPIs were impacted?

A. It is .88, so I'll call it .9 percent.

Q. And then with PIM-C off?

A. About 1.2 percent.

Q. So then what's your take-away from that, that with PIM-C on and PIM-C off, the various percentages?

A. You know, it's -- it's consistent with what we see when I'm out looking at, you know, individual radios and turning PIM-C on and off, and that is that PIM-C, sometimes it helps and sometimes it doesn't. What it really says is it helps, but it -- it doesn't cure the problem. Like when we fix a problem, it's cured and it's gone, whereas like --

THE COURT: Mr. Taylor, could you slow down just a little bit?

THE WITNESS: I'm sorry.

THE COURT: It's long answers and you're awfully fast.

THE WITNESS: I'm sorry.

THE COURT: If you'd slow down, I'd appreciate it.

THE WITNESS: Okay. I'll do my best.

THE COURT: Pick up where you left off.

THE WITNESS: Okay. So let me figure out where I left off.

Q. (BY MR. NELSON) Let me just ask you another question.

A. Okay.
Q. So then is -- with PIM-C on, is the percentage of radios, radio channels, rather, with internal PIM detected and KPIs actually performance impacted, lower than with PIM-C off?
A. Yes.
Q. And what's the difference, roughly, in that percentage?
A. About three-tenths of a percent.
Q. Yeah. And if we compare that to 1.2, it would be about say 25 percent or so?
A. Yeah. As a percentage of the change of percentage, yeah, about 25 percent.
Q. And that 25 percent, now if we look at just where the percentage where internal PIM is detected at all, do you see that?
A. Yes.
Q. And now it's -- with PIM-C off, it's about 2 percent? Is that right?
A. Yes.
Q. And how about with PIM-C on?
A. PIM-C on, it's about one and a half percent.
Q. So then, again, we're at about -- what's the percentage?
A. Depending on what you put in the denominator, 25, 30 percent.
Q. Okay. Now, is that consistent with your experience?
A. Yes. Yes, it is.

Q. And can you explain to us why that's the case?
A. Well, what we see in the field when we're out doing just, you know, testing with test equipment and observations and things like that, we see that sometimes the -- the PIM-C is -- is very effective, sometimes it's a little bit effective, and sometimes it just doesn't seem to be effective at all.
Q. And let's just be clear. So do all -- is that 25 percent of all the radio channels out there, meaning -- meaning for PIM-C to do anything, do you need to have PIM in the first place?
A. Yeah. There's no point in doing anything unless PIM-C is -- unless PIM is there and causing -- and detectable. Right? Otherwise, there's nothing to fix.
Q. And remind us about how frequent is it that things would be broken in the line such that you would have a PIM issue at all with respect to that radio channel.
A. Yeah. This data shows about 2 percent of the time.
Q. Okay.
MR. NELSON: So, Your Honor, may I have leave to pull up the chart?
THE COURT: You may.
MR. NELSON: Thank you, sir, Your Honor.
Q. (BY MR. NELSON) So now do you see here where it says if PIM-C is on, that means a PIM issue is present on that radio channel? Do you see that?

A. Yes.
Q. Do you agree with that?
A. Well, no, because when -- we turn PIM-C on in just about all the radios, and we also know that PIM isn't present on most of those radios. So I don't agree with that.
Q. And based on the data here that -- that you talked to us with, what percentage of radios would actually have any PIM issue at all?
A. Internal PIM?
Q. Yes, thank you. Internal PIM issue at all.
A. For the dual and tri-band, about two percent. And it just depends, you know -- it varies a little, but that's about the highest I've seen is 2 percent.
Q. And what percentage would have any effect actually on performance, meaning it's to the level where you'd do something about it?
A. It would be quite low. It would actually be lower than this 1 percent because this is actually a much higher bar than, you know, we would actually use to go out and deploy resources.
Q. So then I see it here it's 67,159 radio channels, which would be a half or a third of that, in terms of number of radios, have PIM-C on. Right?
A. Correct.
Q. So because PIM-C's on, do you think that all of those

radios and radio channels are experiencing an internal PIM problem?

A. No, definitely not.

Q. And does the data support that?

A. Yes. Yes, it does.

Q. Now, sir, do you see that first one? It says, Site hygiene not equal to internal PIM. Site hygiene is not equal to internal PIM. Do you think that at AT&T, that site hygiene, doing the maintenance, testing, and installation, is a way that AT&T deals with internal PIM?

A. Yes. When you say site hygiene, if you mean like, you know, making sure everything's working properly, then, yes, that's our primary means of --

Q. The primary -- can you explain that?

A. Yeah. So, you know, we've -- the way I look at it, we have three tools in our tool belt. Right? We have finding and fixing the PIM. Sometimes people call that hygiene. We have -- we can turn the offending leg of the radio off, basically just turn it off. And then we also have the PIM-C feature in the radio.

And the reason why the hygiene is our primary one or fixing is because it always fixes the problem. It's not there. You know, when you're done, there's no performance impact.

And -- but when it comes to like the PIM-C, for example,

you know, that only reduces the PIM; it never just makes it entirely go away.

Q. So then do you agree with the assumption that fixing the connectors, making sure things are installed properly, is not a way that AT&T can deal with internal PIM issues?

A. Can you ask that again, please?

Q. Yeah, I can try.

So if somebody said, hey, you can't use site hygiene and installation procedures to minimize any internal PIM issue, would you agree with that?

A. If they said we can't?

Q. Yeah, you can't do it, it's too expensive, you can't do it. If they said that, would you agree with it?

A. Oh, no. I would totally disagree. That's the way we've handled internal PIM since the first radio was turned on in the network.

MR. NELSON: Your Honor, may I?

THE COURT: You may. You may use the chart.

Q. (BY MR. NELSON) Now, we talked about this a little bit earlier, but that P614, the Ericsson part?

A. Yes.

Q. Now, was the data in this Los Angeles study that you're talking about dealing with internal PIM?

A. No, it was only for external PIM.

Q. And would throughput issues, in other words, the effect

of throughput on -- from external PIM, be relevant to an internal PIM issue?
A. No, that is not relevant data.
Q. And why is that?
A. Well, it's -- it's because -- going back to that point again, that with external PIM, you're affecting the performance of all of the receive branches rather than just the one that has internal PIM.
Q. Okay. And the last one there that says if somebody told you that, hey, internal PIM and external PIM are the same problem, they have the same negative effect on the network, would you agree with that?
A. In terms of the magnitude of the effect, that's -- I would -- I would disagree with that.
Q. And why is that?
A. Again, because it's -- here's the way I like to look at it. You know, if you have someone that's hard of hearing, you know, it's -- if you're hard of hearing in one ear, it's kind of irritating. But if you're hard of hearing in both ears, it's kind of a big deal. And that's essentially the difference. Right?
Q. Now, just want to finish with this. Sir, do you believe that the PIM-C in the Nokia radios has no benefit whatsoever?
A. Oh, it definitely has a benefit.
Q. Okay. And -- and what is that?

A. Well, it's -- like I said, it's kind of the third tool in our tool belt. It helps us, you know, delay and put off having to go out and fix the problem in some cases.

Q. Thank you, sir.

MR. NELSON: Your Honor, at this point I have no further questions. I pass the witness. And may I go ahead and flip this down and put it back?

THE COURT: You may. If Mr. Ward wants to use it, he's entitled to use it during cross. So go ahead and put it back if you will, Mr. Nelson.

MR. NELSON: Yes, Your Honor. Thank you.

THE COURT: Do you have cross examination, Mr. Ward?

MR. WARD: I do. I have a few binders to pass out as well.

THE COURT: You may distribute binders.

All right. Proceed with cross examination when you're ready.

CROSS EXAMINATION

BY MR. WARD:

Q. Good morning, Mr. Taylor.

A. Good morning.

Q. My name is Johnny Ward, and I don't think you and I have met before today, have we, sir?

A. No, we have not.

Q. And you've not been here throughout the trial. Correct?

A. No, I have not.
Q. And the jury heard us do something called invoking the Rule early on in the case, and that meant that witnesses other than experts, designated experts, and corporate representatives, couldn't be in here to listen to everything that was being said. Do you understand that?
A. Yes, I understand that.
Q. And you haven't been reviewing the transcripts or being told what's going on in this courtroom, have you, sir?
A. No, I have not.
Q. All right. I wouldn't expect that you had been.
And you're here because you're, I think you said, the PIM guy.
A. I'm the PIM guy.
Q. At least for this trial for AT&T, you are the PIM guy. Correct?
A. Yes, I am.
Q. And in connection with being the PIM guy, you provided a disclosure of some of your opinions. Correct?
A. A disclosure, I guess, yes.
Q. Okay. And if you need to look at it, there's -- in the notebook there, I believe it is under the third tab entitled Taylor Disclosure.
A. Okay. Thank you.
Q. One of the opinions that you provided was that there is

no inherent PIM present in properly configured and functioning Nokia radio equipment.

A. That's correct.

Q. It doesn't exist -- in a radio that is properly configured and functioning properly, there is no PIM. Internal PIM.

A. There is no detectable internal PIM.

Q. And is that regardless, in your opinion, of whether the PIM-C functionality is turned on or off?

A. Yes, it is.

Q. So really in a radio that is properly configured and functioning, what you're telling the jury is you don't need PIM-C.

A. It's not absolutely necessary, no.

THE COURT: Speak up just a little bit, Mr. Taylor.

THE WITNESS: Oh, sorry.

Q. (BY MR. WARD) Another opinion that you expressed is that Nokia's PIM-C capable radios do not regularly experience PIM. Fair?

A. Correct.

Q. And only, only, experience PIM in situations where the radio needs repair. Example, a connector is loose or broken. Do you still stand by that opinion?

A. Yes, for internal PIM.

Q. So you're telling the jury that internal PIM is only

experienced when something's broken.
A. Yes.
Q. Do you know Dan Edwards?
A. Yes, I know Dan.
Q. How long have you known Mr. Edwards?
A. Fifteen years, I would guess.
Q. Is he an honorable man?
A. Yes. Yes, he is.
Q. Is he trustworthy?
A. Yes.
Q. If he were to tell you something, would you say, I can take that to the bank?
A. Sometimes. It depends on -- engineers have -- don't always agree on things. So it would just depend on what he said.
Q. Do you think he's a competent engineer?
A. Yes.
Q. How long has he been with AT&T?
A. Oh, I don't know offhand. A long time.
Q. Have you ever heard about something called third order conflicts being caused by bands 12, 14, and 29 being located in the same unit?
A. By conflicts if you mean PIM, yes.
Q. Do you think the way that AT&T purchases its spectrum contributes to internal PIM in these radios?

A. You mean in terms of the exact blocks that are purchased? Yeah, it's the combination of -- the exact combination that affects where the third order of PIM products fall, yes.
Q. And the way that AT&T has gone about acquiring its spectrum has contributed to internal PIM in its products, has it not?
A. Yes.
Q. And you told the jury that Ericsson doesn't have PIM-C in its radios?
A. That's correct.
Q. But do you know that as recently as August of this last year, that Mr. Loddeke was discussing with Ericsson putting PIM-C in their radios?
A. Yes.
Q. And, in fact, do you know that Ericsson is coming out with dual band and tri-band radios with PIM-C in them?
A. As far as I know, they don't plan to do that.
Q. And you haven't seen all the documents that have been presented to the jury in this case, have you?
A. No, I don't. I haven't.
Q. And if a document were to indicate that the plan was in late 2022 or 2023 for Ericsson to include PIM-C in its radios, you wouldn't disagree with that, would you?
A. No. That's not a central part of my job to be up-to-date on all of that.

Q. So you say that PIM-C has some benefit, some value. Correct?
A. Correct.
Q. And is it your testimony that PIM-C's only value is in detecting broken equipment?
A. Not detecting, but mitigating PIM when things are broken, yes.
Q. Would you agree with me that the folks in AT&T inside of AT&T, including yourself, started focusing on PIM as a problem sometime in 2018?
A. Yes, for external PIM, that's true.
Q. And there was a PIM task force that was created that you were basically the head of. Correct?
A. Correct.
Q. And that was in 2018, and the jury's seen that document. It's DX 93.
MR. WARD: If we could pull it up.
Q. (BY MR. WARD) You've seen this document before, have you not?
A. Yes, I have.
Q. You're one of the authors on it?
A. Correct.
Q. And we'll scroll through a couple of things here.
MR. WARD: Next page.
Q. (BY MR. WARD) The jury's seen this. There was a lot of

focus on trying to address PIM beginning in 2018. Correct?
A. That's correct.
Q. Prior to that date, had there been a national task force with tiger teams within AT&T?
A. No, not to my knowledge, no.
Q. But that's something that you -- you spearheaded, let's develop teams, let's have a tiger team, let's have various teams that are going to try to tackle PIM. Correct?
A. Yes, external PIM specifically.
Q. And that started in 2018. Correct?
A. Correct.
MR. WARD: You can take that down, Mr. Boles.
Q. (BY MR. WARD) All right. I want to talk to you about DX 274. Now, we were looking at this chart during your direct examination. Do you recall that?
A. Yes.
Q. And this is 274.2.
Now, this chart, is this what you were referring to as the study?
A. Yeah, this is a June 9th study, the nationwide study, yes.
Q. And the June 9th was just the data for one day. Correct?
A. Correct.
Q. And then you created this chart. Is that right?
A. That's correct.

Q. And basically what we've got with the June data --

MR. WARD: And go to the next page, Mr. Boles.

Q. (BY MR. WARD) -- were pages and pages. If we looked at this in the native format, we could scroll and there was lots of data, was there not?

A. Correct.

Q. And would you agree with me this is just a snapshot of the network on one day? Correct?

A. Yes, that's correct.

Q. And so you've got this snapshot of the radios on one day in June. Correct?

A. Correct.

Q. And is this the type of data that is available day after day after day looking back for a year?

A. Yes. Now, we have the ability to look at not this exact data, but, you know, data that might give similar insights, yes.

Q. And if we go to the study, your study that you've presented to the jury and I think that Doctor Becker relies upon, is based upon one day of data for the condition of these radios.

A. That's correct, yes.

Q. And you testified that there's really not much variance day-to-day with PIM. Is that what you testified to?

A. That's correct.

Q. Not much variance.
A. Correct.
Q. Not much variance month-to-month, year-to-year? It stays the same?
A. It doesn't always stay the same. There's a lot of times long-term trends that can, you know, move the data a little one way or the other.
Q. But if it's detecting -- you said it's detecting only problems, broken connectors, problems with the radio. Correct?
A. Correct.
Q. That doesn't vary day-to-day, or is it the same radios stay broken day-to-day and we don't know -- we know these just stay broke so our 2 percent are going to be the same broken radios day-to-day?
A. Yes, but as the network goes on, we deploy more radios, we fix radios, things like that so that number is always changing up or down a little bit. As you know, the network ages and we respond to problems.
Q. But it's still your testimony that PIM doesn't vary day-to-day?
A. That's correct. Not substantially, no.
Q. But the data is just kind of a one-off. Right? Because, I mean, you've got data from multiple days. You could pull from any month, any year.

A. Correct.
Q. But -- so the data from June 9th is just kind of a one-off set of data that you used for your study. Correct?
A. Yes.
Q. And this lawsuit, I'll represent to you, has been pending since August of 2021. Okay?
A. Okay.
Q. So almost two and a half years. And the study that you conducted was on one day.
A. Correct.
Q. And you would agree you don't dispute that it's AT&T's policy to have PIM-C enabled on every radio. Correct?
A. That's correct.
Q. Now, let's talk about this data from June of 2022. It's got the condition of the radios, whether PIM is present, whether PIM-C is on or off. Correct?
A. That's correct.
Q. And isn't it true that prior to the lawsuit, you didn't know that the status of the radio was something that was even available?
A. I knew that the status is available. I knew that, yes.
Q. Okay. If you'd like, you can refresh your recollection. Your deposition is there in front of you. If you go to page 29, lines 11 through 17. And this is from your deposition on -- I know you've got two of them. Let me give you the

right one. Your deposition of October 6, 2022?
A. Page 29, you said.
Q. Yes, sir.
A. Okay. I have it.
Q. If you can read lines 11 all the way to the bottom, if you'd like to, because I'm going to ask you some questions and this might refresh your recollection.
A. Okay.
Q. Have you had an opportunity to refresh your recollection?
A. Yes.
Q. And isn't it true that prior to the lawsuit, that you didn't know that the status of the radios was in a document some place?
A. Can you ask that again? I didn't quite understand.
Q. Yes, sir. Isn't it true that prior to this lawsuit, that you didn't know that the status of the radios was available and that it was in a document some place?
A. I knew you could pull any -- the status of any of the radios and things like PIM-C, yes. I mean, I know that that capability has always existed.
Q. All right.
MR. WARD: Mr. Boles, would you pull up Mr. Taylor's deposition, lines 11 through 17?
Q. (BY MR. WARD) So the question was, "So before you said that you weren't aware of the document that someone had

actually pulled the status of the radios, what did you mean by that?"

And you got to see that we were talking about the June data. Correct?

A. Correct.

Q. And your answer in your deposition was just that I -- I hadn't known that someone had done that, but -- and that it was in a document some place. Was that your answer, sir?

A. Yes.

Q. And you don't know who actually selected the radio status information, either, do you?

A. No, I don't.

Q. And you don't know how to even figure out who ran this report?

A. No, I don't.

Q. And for the study of the one day of data, the algorithms that you utilized for determining whether key performance indicators were impacted, is an algorithm that you created. Correct?

A. Correct.

Q. And that's proprietary. It's secret. Correct?

A. It is proprietary, yes.

Q. And there's no other day of data that the jury can look at to see how it compares to this, to see whether or not there's variance, is there, sir?

A. No, not here, no. Not that I've seen.
Q. So you understand that AT&T is facing a substantial damages claim in this case, don't you?
A. Yes, I do.
Q. And you have data that in 274 --
MR. WARD: You can take that down, Mr. Boles.
Q. (BY MR. WARD) -- that purports to show the status of Nokia's radios for one day. Correct?
A. Correct.
Q. A snapshot.
A. Yes.
Q. A one-off.
A. Yes.
Q. That you didn't know, according to your deposition, that existed. Correct?
A. Yes. I didn't know that someone had pulled that specific report for that day.
Q. Don't know who pulled it. Correct?
A. Correct.
Q. You didn't even know it existed, did you, sir?
A. No, I did not.
Q. And you're the PIM expert for AT&T. Correct?
A. That's correct.
Q. You don't know who generated the information, do you?
A. Not the status of the radios, no.

Q. Wouldn't you agree with me that it's really kind of impossible to draw any definitive conclusions from one day of data in the AT&T network?
A. No, I disagree with that.
MR. WARD: Could I have the document camera, Ms. Brunson?
Q. (BY MR. WARD) Does that look like an email from you dated July 31st, 2019?
A. Yes, it does.
Q. Do you know Shane Mooney, Dean Moore, Michael Weaver?
A. Yes, yes, I do.
Q. And the subject line is PIM and Automation Process Discussion. Do you see that, sir?
A. Yes.
Q. Now, I want to look at the first paragraph of that email. This is something that you wrote, is it not, sir? I'm going to put it back down there. I'm not trying to trick you.
A. It was going in and out of focus. I thought it was my glasses or something.
Q. I agree. I'm going to try to fix that.
THE COURT: Yes, Mr. Nelson. Do you have something? You're on your feet.
MR. NELSON: Yes. Is this an exhibit? I don't have it in the binder.
MR. WARD: It's for impeachment, Your Honor.

MR. NELSON: Well, I was just going to try to follow along. I don't have a copy.

MR. WARD: Sure. I'll give you a copy.

MR. NELSON: Yeah. Thank you.

THE COURT: If it's a prior inconsistent statement of the witness, it does not have to be admitted or disclosed in advance if it's used for impeachment.

Let's proceed.

Q. (BY MR. WARD) You're talking about the entire PIM detection, quantification, remediation process is still evolving even after one-plus years of work. Correct?

A. That's correct.

Q. Do you remember writing this email? Have you seen it before?

A. I don't remember this specific email.

Q. Okay. Let's see what you wrote in the next paragraph.

THE COURT: You haven't made any paper airplanes lately, have you, Mr. Ward?

MR. WARD: I'm not very good at it, Your Honor.

Q. (BY MR. WARD) In the next paragraph, you wrote, However just like every other PIM process, it's not perfect.

And you can read along. I'm going to get to the next sentence, because you wrote, Like any other PIM test, it is almost impossible to draw definitive conclusions from a one-off test as PIM changes so much from minute to minute,

hour to hour, day to day, month to month.

Did you write those words, Mr. Taylor?

A. Yes.

MR. WARD: I pass the witness.

THE COURT: Additional direct, Mr. Nelson?

MR. NELSON: Yes, briefly, Your Honor. May I proceed with redirect, Your Honor?

THE COURT: Proceed with redirect.

MR. NELSON: May I have the document camera, please?

REDIRECT EXAMINATION

BY MR. NELSON:

Q. So the email here that Finesse counsel just showed you, were you talking about internal PIM here or external PIM?

A. That was specifically about external PIM.

Q. Okay. Can you explain to us why that's the case?

A. Well, everything we did in this process was all about external PIM. But specifically it's talking about this pressure test, and that was a test that we were trying to develop at the time to quantify the effect of external PIM on, you know, if external PIM is present. And what we find is that external PIM is much more variable in terms of it coming and going for just a whole variety of reasons compared to internal PIM.

Q. Okay. And what are some of those reasons?

A. Weather reasons. It can be like, for instance, you can

have external PIM caused by a car in a parking lot parking in front of an antenna. So one day a car is parked in front of it and the next day it's gone. So there's, you know, a lot more heating and cooling issues. You know, if an air conditioner is turned on and vibrating in front of the antenna.

So what we find is that external PIM is much, much, much more variable than internal PIM.

Q. So, now, sir, would the pressure test study that -- regarding external PIM be relevant to your studies of internal PIM?

A. No. That was purely having to do with looking for external PIM.

Q. And why's that the case?

A. That specific test, that's just the way it was designed. It was really only -- only to -- to find external PIM on a site in worst case scenarios.

Q. So in terms of internal PIM, you're the PIM guy at AT&T, what's your experience with how frequently internal PIM issues change with respect to a particular radio?

A. It's -- it's infrequent. It -- it happens on occasion, but it's much more steady and -- I guess steady is probably the best word in terms of when it appears and then when it gets stayed as opposed to external PIM.

Q. And why is that?

A. Just that there's a lot more factors that affect external PIM that are environmental outside of our control, whereas this is -- you know, there's just one cause for internal PIM.
Q. And what's that one cause?
A. That something is broken.
Q. So now counsel asked you whether internal PIM could get worse over time.
A. Yes.
Q. So once AT&T sees an internal PIM issue with a particular radio, what does AT&T do?
A. The primary thing we do is we dispatch a crew to fix it.
Q. So if it's fixed, if the crew goes out and fixes it, is there, like you said at installation, another test run or something like that?
A. Yes. We run the same -- same tests that we do when we initially commission the radios to make sure the crew successfully fixed -- fixed the problem.
Q. So then when the radios are installed, so it's day one, are there any internal PIM issues with that particular radio?
A. No. We -- we don't accept them into the network unless all of the internal PIM issues are resolved.
Q. And does AT&T provide specifications for like the feed line, the connectors, the antenna, that are targeted towards eliminating some internal PIM issue?
A. Yes.

Q. And can you explain to us why that's the case?
A. Well, because ultimately it's under our control. Right? I mean, so we -- we specify all of the -- all of the components in terms of their PIM performance such that, even under worst case conditions, as long as everything's working properly, that there's no detectable PIM.
Q. So thank you, sir. I appreciate your time, and I have no further questions for you.
MR. NELSON: And I pass the witness, Your Honor.
THE COURT: Thank you.
Is there additional cross examination?
MR. WARD: Your Honor, I forgot to offer that exhibit, the next exhibit. It's Plaintiff's Exhibit 1384.
THE COURT: Is there objection?
MR. NELSON: It wasn't on the exhibit list, Your Honor.
MR. WARD: It's not, Your Honor. I'm offering it now. It was used for impeachment. He's now asked questions about it. We'd like to offer it.
MR. NELSON: Well, I don't believe it was proper impeachment, Your Honor. It was external PIM. He was talking about internal PIM.
THE COURT: Well, I understand there's a difference of opinion about what it covers and what it doesn't cover, but the record needs to be complete.

I'll accept it into the record.

MR. NELSON: Okay. Thank you, Your Honor.

MR. WARD: May I approach, Your Honor?

THE COURT: You may hand it to the Courtroom Deputy. I gather you don't have additional cross?

MR. WARD: No recross.

MR. NELSON: And may this witness be released, Your Honor, so that he could --

THE COURT: I'll release him as soon as I tell him to step down off the witness stand.

MR. NELSON: Okay. I'm sorry, Your Honor.

THE COURT: Mr. Taylor, you may step down.

THE WITNESS: Okay. Thank you.

THE COURT: And you are released. You are free to stay; you are free to leave.

THE WITNESS: Okay. Thank you.

MR. NELSON: Thank you, Your Honor.

THE COURT: All right. Defendants and Intervenors, call your next witness.

MR. NELSON: Your Honor, my colleague, Ms. Brianne Straka, is going to be handling this witness.

THE COURT: That's fine. I'll hear from her.

MR. NELSON: Thank you, Your Honor.

MS. STRAKA: Defendants call Mr. Teddy Davis.

THE COURT: All right. Mr. Davis, if you'll come

forward and be sworn by the Courtroom Deputy, please.

(Whereupon, the oath was administered by the Clerk.)

THE COURT: Please have a seat at the witness stand. Mr. Nelson, would you mind moving this chart back to where it was while your colleague sets up for direct?

You may distribute binders, counsel.

MS. STRAKA: Thank you, Your Honor.

THE COURT: All right. Let's proceed with direct examination.

TEDDY DAVIS, SWORN,

testified under oath as follows:

DIRECT EXAMINATION

By Ms. Straka:

Q. Good morning. Mr. Davis, will you please introduce yourself to the jury?

A. Yes. My name is Teddy Davis. I'm an engineer, work for Nokia.

Q. And, Mr. Davis, where were you born?

A. I was born in Arlington.

Q. In Arlington, Texas?

A. Yes, ma'am.

Q. Where do you live now?

A. I live in Fort Worth, Texas.

Q. And, Mr. Davis, you already mentioned that you work for Nokia. What do you do for Nokia?

A. I'm a digital hardware engineer, specializing in FPGA design.
Q. Which facility of Nokia's do you work in?
A. I work in the Dallas office of Nokia.
Q. Mr. Davis, did you prepare some slides to help with your testimony today?
A. Yes, ma'am.
Q. Before we get into a little more detail about your current role at Nokia, can you tell me a little bit about your educational background?
A. Yes, ma'am. I have a degree in mechanical engineering and a degree in electrical engineering from UTA.
Q. And can you also tell us a little bit about your work history?
A. Yes, ma'am. I started at Motorola straight out of college in 1994, and I worked for them as a mechanical engineer for a year, decided I wanted to go back to school and get an electrical engineering degree.
I worked full time, went to school at night, got that degree, transferred over to the electrical engineering department, and then I've been an electrical engineer since 1999 with Motorola and Nokia.
Q. How did you come to work at Nokia?
A. Our Motorola division was actually purchased by Nokia.
Q. And so long together have you been working at Motorola

and Nokia combined?
A. Almost 30 years. I think 29 years exactly or pretty close to it. January 4th was my service date.
Q. Can you describe, generally speaking, the business that Nokia is in?
A. They are a cell phone or cellular network provider. They provider mainly cellular networks and backhaul equipment for cellular networks.
Q. You mentioned cellular equipment. Can you describe what some of that cellular equipment is?
A. Radios, the backhaul equipment that attaches to the radios, pretty much anything that is not the commodity items like antennas or cables or anything like that. Just the actual hardware that is used in the cellular networks.
Q. We've been hearing a bit about base stations in this case. Are you referring to base stations?
A. Yes, ma'am.
Q. And how does Nokia develop these base station products?
A. We have a team of hundreds of engineers that are in charge of developing pieces of the base station. We'll have receiver designers, transmit designers, mechanical designers, digital baseband designers, factory technicians, and technicians in general, and purchasing. There's just -- there's hundreds of people that go into designing a radio.
Q. And as part of your work at Nokia, have you been awarded

any patents?
A. Yes. I've got one patent from Nokia and then one patent from when I worked at Motorola.
Q. We were just talking a bit about the research and design that Nokia does. Are you familiar with Nokia's research facilities?
A. Yes, ma'am.
Q. Where are Nokia's research facilities located?
A. The main one that we have is Bell Labs in New Jersey, but there's also some in Finland and Germany, also.
Q. Have you created a slide to help us talk about Bells Labs?
A. Sure. Yeah. Bell Labs was -- came around back in the -- when AT&T was actually one of the baby Bells or one of the Bell systems, and they've invented many, many different things, you know. What's been shown on the TV here is, you know, the transistor and lasers and HD TVs and stuff like that.
Q. What type of work is Bell Labs working on today?
A. They're working on probably the next generation of cellular networking, probably 6G, maybe even 7G.
Q. And you mentioned some of the innovations that Bell Labs has made over the years. Has Bell Labs received any awards for these innovations?
A. I believe they have about nine Nobel prize winners.

Pretty historic to get that for sure.
Q. Now, the jury's been hearing a bit about certain Nokia radios in this case. Are you familiar with the Nokia AirScale radios?
A. Yes, ma'am.
Q. How did you become familiar with the Nokia AirScale radios?
A. It's basically what I've been working on for the past 11 years since I started at Nokia.
Q. And here you've -- what are you showing here on your demonstrative slide 4?
A. This is one of the radios, is how they actually look, for -- in the -- I don't know which variant it is, but it's -- they're all pretty similar.
Q. This is one of the accused radios in this case?
A. I'm assuming. It looks like one of them, yes, ma'am.
Q. Can you kind of describe for the jury, what are the size of these radios?
A. It's -- I would say it's probably about a foot wide, maybe two and a half feet long or two and a half feet tall, and probably about eight or 10 inches thick.
Q. And there's a lot of different components within these radios?
A. Yes, ma'am. There's the radio itself, the transmit TRX. There's duplex filters. There's linear power amplifiers,

connectors, you know, heat syncs, mounting brackets, those kind of things.

Q. You mentioned TRX. What are you referring to when you say TRX?

A. It's a portion of the actual base station radio. It's the transmit receive block. It basically has a transmitter on it and a receiver on it.

Q. And with respect to the accused radios here, do you have an internal name for those radios?

A. Yes. We call them the Galaxy radios.

Q. With respect to the Galaxy radios, what types of cellular networks can the products be used in?

A. It can be used in four different types. There is a 2G like GSM. There's WCDMA, which is 3G. It will do LTE, which is 4G. And then it will even do like NR 4 or 5G.

Q. You described a little bit about how these products look and the different features that are in them. About how many people work on the Galaxy radios?

A. In the Dallas office, there's probably 300. But the people in Finland doing the ASIC design, there's problem as many or maybe more. So I would say maybe a thousand or 2,000 people working on these radios.

Q. I'd like to turn to your specific role on the radios. What was your role with respect to the Galaxy radios?

A. I was the FPGA architect for the Galaxy radio.

Q. You just used an acronym, FPGA. What is an FPGA?
A. An FPGA is a -- as it mentions here, a field programmable gate array. It's basically an integrated circuit that has some special circuits inside there that you -- that are allowed to be reprogrammed. Instead of it being a -- you know, a hard ASIC, it's actually reconfigurable. So if you need to make changes, you can do that rather quickly.
Q. You talked a little bit about programming the FPGAs. What types of languages do you use to program the FPGA?
A. You typically use an HDL, a hardware descriptive language. In this case we used System Verilog, Verilog, and VHDL. Those are all hardware descriptive languages. It's kind of like programming, but it's -- it's describing hardware instead of software.
Q. Are you actually involved in the programming of the Galaxy FPGA?
A. Yes, ma'am. I wrote the majority of the code for the FPGA.
Q. By majority of the code, what do you mean by that?
A. I wrote, I believe it was, probably about 80 percent of the code. The HDL code, that is.
Q. There's other code that's also involved in this process. Is that right?
A. Yes, ma'am. There's software. That's mainly what -- there's the hardware and software piece for pretty

much everything we do on this radio.

Q. And you -- I don't believe you said yet. How long have you been working on FPGAs and digital signal processing?

A. FPGAs, I've probably done it, I would say, 15 to 20 years. I don't know -- I don't remember exactly, but I've done it a long time. I did it at Motorola before I came over to Nokia. And DSP has probably been, I would say, the past seven or eight years.

Q. You've been in the courtroom the last few days. Is that right?

A. Yes, ma'am.

Q. Did you hear Doctor Wells testify yesterday?

A. Yes, I did.

Q. And he mentioned that the FPGA within the Galaxy radios has a code name?

A. Yes. It was called GROOT.

Q. Why did -- why is the FPGA called GROOT?

A. As an engineer, we like to make acronyms for things. So we decided that, you know, just to kind of make an acronym that meant something to us, we called it getting rid of offending tones to kind of, you know, make it something that we could talk about and kind of show the actual real purpose of the FPGA.

Q. And in the GROOT FPGA, what type of functionality does it do in the radios?

A. It has really three main purposes. There is a GPIO function where we control the different devices on the TRX board. It does PIM-C, and it also does RX AGC.

Q. You mentioned PIM-C, specifically. Why was the PIM-C functionality implemented in an FPGA?

A. It's a pretty complicated algorithm/implementation. And so specifying the actual performance and implementation would have taken many years to do that. And typically whenever Nokia designs an ASIC, it has to be completely specified and everybody has to agree with that and we have to verify that all of that functionality matches. So there's -- it's a lot of work.

But having an FPGA, it allows us to come up with the initial guess of what we needed to do, and then we can respin it if there was a problem down the road if we had to.

Q. So you were comparing an FPGA to an ASIC. What is an ASIC?

A. An ASIC stands for an application specific integrated circuit. It is a piece of hardware -- it would to be like if you were to go to a computer store and bought a Pentium processor. That is an ASIC. Intel designed that part. It's not programmable in -- you can't change the hardware. But that's what an ASIC is.

And that's -- an FPGA allows to you emulate what an ASIC is by, you know -- you essentially write them in the same

language, but the ASIC is actually hard coded to whatever you did whenever you made the actual mask for that part, whereas an FPGA you can just reprogram it if you need to.

Q. And so here the PIM-C functionality was implemented in an FPGA because that was the practical way to implement the PIM-C functionality. Is that correct?

A. It was the most cost effective way and it was the quickest way that we could get something to market, yes, ma'am.

Q. So the jury's heard a lot about PIM in this case, and I want to take us back to that. We've been hearing a lot about the difference between something called internal PIM and external PIM. Do you have an understanding of those -- that terminology?

A. Yes, ma'am.

Q. And what is the difference between internal PIM and external PIM?

A. Internal PIM is caused by stuff directly influenced inside the radio's transmit line-up, so the feeder cables, as you've probably heard before, the connectors, the antennas; whereas, external PIM has environmental factors that you can't really control, you know, like an air conditioner--you've probably heard that one before--a chain rattling on a gate, a gate rattling open and closed in the wind. Those things can generate PIM, external PIM.

Q. And so with respect to internal PIM, do you guys sometimes use different terminology to describe that within Nokia?
A. Yeah. We sometimes call it line PIM just because it's on the actual transmit lineup.
Q. And with respect to external PIM, do you sometimes have different terminology you use for that within Nokia?
A. We call that air PIM because it usually happens in the open air of the -- around the network or around the radio.
THE COURT: Counsel, approach the bench, please.
(The following was had outside the hearing of the jury.)
THE COURT: Ms. Straka, can you slow down a little bit? You are speaking awfully fast.
MS. STRAKA: Okay.
THE COURT: I didn't want to say it in front of the jury, but I would appreciate it if you would slow down.
MS. STRAKA: I apologize.
(The following was had in the presence and hearing of the jury.)
THE COURT: All right. Let's continue.
MS. STRAKA: Mr. Horseman, can you bring up Exhibit DX 103?
Q. (BY MS. STRAKA) Mr. Davis, are you familiar with Exhibit DX 103?

A. Yes, ma'am, I've seen this before.

MS. STRAKA: And, Mr. Horseman, can you go to page 14?

Q. (BY MS. STRAKA) Mr. Davis, can you describe what's being shown here on page 14 of DX 103?

A. This is a list of things that we do not correct in the internal PIM cancellation inside the FPGA on the Galaxy radios.

Q. So this is a document that's describing the functionality -- and let's actually go back for a minute. I went a little bit too quickly.

MS. STRAKA: If we go back to the cover of DX 103.

Q. (BY MS. STRAKA) This document is titled, LTE2863 PIM cancellation for AirScale dual band radios. Do you see that?

A. Yes, ma'am.

Q. These are the radios that we've been talking about in this case?

A. Yes, ma'am.

Q. And the LTE2863, that's a feature number for the feature that we've been talking about, the PIM cancellation. Is that right?

A. Yes, ma'am.

Q. Okay. If we go back then to page 14, the title of this slide says, What will this feature not do? And it says it will not reduce air PIM.

A. That is correct.
Q. So what does that mean? Will the Nokia radios address external PIM?
A. It will not address external PIM, no, ma'am.
Q. And if you look further down on this page, it says, this feature does not reduce PIM that is created outside the RF connectors, cables, or antenna. Do you see that?
A. Yes, ma'am.
Q. So what type of PIM does the Nokia radios address?
A. It just does line PIM or internal PIM only.
Q. All right. I want to talk a little bit more about the internal functionality of the Galaxy radios.
MS. STRAKA: If we go back to the demonstrative exhibit, can you please pull up slide 7, Mr. Horseman?
Q. (BY MS. STRAKA) Mr. Davis, are you familiar with this figure that's on slide 7 of your demonstratives?
A. Yes, ma'am.
Q. This is a figure that the jury was shown yesterday during Doctor Wells' testimony. Is that correct?
A. Yes, ma'am.
Q. It's from DX 287 at page 15.
Can you describe at a high level what's being shown here in figure 1?
A. Sure. This is the overall TRX radio block diagram, whereas the Nahka ASIC, the baseband processor, is on the

left, followed by -- on the upper portion of it, that's the transmit lineup. The middle piece is the actual FPGA. The stuff in the -- to the right is the data converters, the RF ADCs and -- for both the PIM sniffer path and the uplink path. And then there's the actually transmit receive duplex filter on the upper right.

Q. So this is all a bit complicated. I want to slow down a little bit and talk about some of the individual components.

You first mentioned the Nahka ASIC, and I believe you said it's a baseband processor.

A. Yes, ma'am.

Q. What do you mean by a baseband processor?

A. Typically the definition of baseband is stuff that happens around zero Hertz. So all of the stuff that comes in on the antennas is at a higher frequency, and it needs to essentially get down to zero Hertz to be processed inside the baseband processor inside the ASIC.

And so that's typically what -- and that's where all that takes place is inside that ASIC. All the shifting in frequencies and the filtering and stuff like that happens inside the Nahka ASIC.

Q. And so in the Galaxy radios, the baseband functionality happens in the Nahka ASIC.

A. Yes, ma'am.

Q. Okay. There's something also in the middle of this

diagram called GROOT FPGA.
A. Yes, ma'am.
Q. Is that the FPGA we were just talking about?
A. Yes, ma'am.
Q. Is the GROOT FPGA a baseband processor?
A. No, ma'am.
Q. Why is the GROOT FPGA not a baseband processor?
A. It doesn't process anything at baseband. It processes the uplink and the PIM at the frequencies that they come into the -- in the FPGA itself.
Q. And what frequency algorithms are those at about?
A. It just depends on the band combination, but it's -- there is -- it's never at zero frequency; it's always offset by something. But it just depends on the variant what the frequency algorithms. But it's typically based upon the transmit frequencies and the uplink frequencies.
Q. And so you're talking about the different transmit frequencies. For example, the -- something at band 14 is at a different transmit frequency than something at band 17. Is that what you're saying?
A. Yes, ma'am.
Q. On the next slide of your demonstrative, DDX 4.8, what are you illustrating here?
A. This is the downlink path from the baseband processor out through the antenna.

Q. And so with -- the downlink signal is the signal that the base station is trying to send to the phone. Is that correct?
A. That is correct.
Q. And so it starts in the Nahka ASIC and eventually it gets transmitted. Where does it get transmitted to the phone?
A. Actually, it comes from the core network into the Nahka ASIC and then out from the antenna down to the cell phone.
Q. And is the antenna shown on this diagram?
A. Yes. It's in the upper right-hand corner of the -- the diagram.
Q. What are you showing here on DDX 4.9?
A. This is to kind of show the actual receive lineup for the actual receive data or the uplink data coming into the antenna and then going down into the FPGA.
Q. You just referred to uplink data. That's the data that's coming from the phone into the base station. Is that right?
A. Yes, ma'am. It's the data up from the ground up to the antenna. That's why you do them up and down links.
Q. Now, if we look at the upper right-hand corner of this figure --
MS. STRAKA: Mr. Horseman, I'm not sure if you can blow that up.
Q. (BY MS. STRAKA) -- it says, PIM sources, TX duplexer, ANK connector/cable interface, cable and antenna. Do you see that?

A. Yes, ma'am.
Q. What is that referring to?
A. That is all the sources of internal PIM that are -- could be present if there is a PIM problem.
Q. And in this case are the PIM sources transmit signals or receive signals?
A. The transmit signals are the ones that actually generate the PIM.
MS. STRAKA: And so if you scroll back out.
Q. (BY MS. STRAKA) There's another path that we haven't talked about yet that's on this diagram, and that's the path that's highlighted in red. Can you describe for the jury what is the path that's highlighted in red?
A. We call it internal as the PIM path, but it's really the TX sniffer path or the TX reference path.
Q. And so what signals are transmitted on that path?
A. They're not really transmitted; they're received. But it's the transmit signals are received on that path.
Q. And the transmit signals are sent to the GROOT FPGA?
A. Yes, ma'am.
Q. Are there any signals other than the transmit signals on that path?
A. No, ma'am.
Q. Do you see the legend in the bottom right-hand corner of this diagram?

A. Yes, ma'am.
Q. It says that the red path is the DL(TX) reference and modeled PIM path?
A. Yes, ma'am.
Q. Why is the red path labeled that way?
A. I believe it's -- since there's two inputs, the one, I guess based on yesterday, the upstream of the FPGA is the TX reference path and downstream of the PIM adaptive model is the actual modeled path.
Q. And so you're referring to upstream and downstream which was terminology we used yesterday. So you're saying the signals coming into the RF ADC, it's only the transmit signals. Is that correct?
A. Yes, ma'am.
Q. And then the PIM modeling is actually done. Where is it done on this diagram?
A. It's done in that actual block PIM adaptive model, and then it's out put from that block.
Q. And so were you here yesterday when Doctor Wells said that there was a signal that was the modeled PIM path?
A. Yes, ma'am.
Q. Is there a signal called the modeled PIM path on that red path?
A. Not going into the FPGA, no, ma'am.
Q. Because where -- the modeling is done where?

A. The modeling is done inside the FPGA.
Q. And so the input into the FPGA is -- on that red path is what?
A. It is the sampled transmit signals from the actual antenna through the analog signals into the RF ADC converted into a digital stream going into the FPGA.
Q. How many transmit signals are there?
A. It depends on the number of bands, but in these cases it could be two or three.
Q. Let's take a look at how the PIM is actually modeled. And to do so, I'd like to take a look at DDX -- the next DDX here.
Can you explain what the PIM engine is?
A. Yes. That is the actual block inside the FPGA that is used to actually generate the PIM model itself. And as you notice here, there's four of them because each FPGA does two antennas' worth and there's two bands on each antenna. So the two times two equals the four NL blocks you need. And each one of those NL blocks does a correction for one band.
Q. And so there's a correction done on each of the -- of two bands. Is that correct?
A. Yes, ma'am.
Q. And is that always the case in the GROOT FPGA?
A. No, ma'am. There is -- sometimes there can be a tri-band, and we typically -- whenever there is a tri-band, we

either can catenate the bands together to make a wider -- make it look like a single band or we just use two bands, because there might not be any PIM from one of the bands onto the other one, and it just depends on the band combinations.

Q. Going to the next slide, what have you depicted here? And you're referring here to DX 281?

MS. STRAKA: Can we actually pull up DX 281, Mr. Horseman? Can you go to the next page? The next page.

Q. (BY MS. STRAKA) At the top of this document, Mr. Davis, it says, the PIM-C FPGA GROOT architecture specification. Do you see that?

A. Yes, ma'am.

Q. Are you familiar with this document, DX 281?

A. Yes, ma'am.

Q. What is DX 281?

A. It is the actual architecture spec for the GROOT FPGA.

Q. And are you one of the authors of this document?

A. Yes, ma'am.

Q. And is the -- does this generally describe how the GROOT FPGA works?

A. Yes, ma'am. It has all the blocks inside there and a general description of what each block does, yes, ma'am.

MS. STRAKA: Okay. If we go to page 76.

Q. (BY MS. STRAKA) Can you describe what's being shown here in the figure on page 76 of DX 281?

A. Yes, ma'am. This is the model portion. We call it the NL block, the non-linear block of the actual -- and this is calculating the terms of that non-linear block.

Q. On the left-hand side of this figure, there is a notation X1 and X2.

A. Yes, ma'am.

Q. What are X1 and X2?

A. X1 and X2 are the bands for the actual transmit. So it's the data from the antenna through that TX sniffer port coming into the FPGA.

Q. And this shows how the PIM model is actually calculated in the GROOT FPGA. Is that right?

A. Yes, ma'am. It shows the different blocks that you would use to actually calculate the different terms, yes, ma'am.

Q. How are X1 and X2 used in the PIM model?

A. Depending on what band combinations are present on the radio and what PIM products you need to create -- or PIM model you need to create, you would use -- pick and choose which one of those, either X1 or X2, or both, or sometimes you use just one of them, sometimes you use the other. It just doesn't matter -- doesn't matter because you can create pretty much anything you need from any one of those blocks. Or any one of those inputs, rather. Sorry.

Q. And you said, again, these inputs relate to the transmit signals. Is that right?

A. Yes, ma'am.
Q. Is there ever an x3 used in this the GROOT FPGA?
A. No, ma'am.
Q. Why is that the case?
A. Because we only have two bands or we can only capture or correct two bands' worth of data in the FPGA. So we never really need a third band at all.
Q. And that's true even for the tri-band radios. Is that right?
A. Yes, ma'am. As I explained earlier, sometimes we can catenate the bands together because they are so close in spectrum that it looks like one wider band, or we just use two of the bands to calculate the PIM products for that band.
Q. So how many signals are used to calculate the -- the PIM model in the GROOT FPGA?
A. We only need two inputs.
Q. I want to now talk about -- a little bit more about how the subtraction is actually done, so how the PIM is removed from the signal.
MS. STRAKA: Can we go back to DDX 7?
THE COURT: Let me interrupt at this stage.
We are right at the noon hour, ladies and gentlemen, and this examination has some additional time to it. I'm not going to go into the lunch hour. I'm going to recess for lunch at this time, and we'll pick back up with direct

examination of this witness after lunch.

If you will, take your notebooks with you into the jury room. Ms. Clendening tells me that your lunch is there and ready. If you will, follow all my instructions, including, of course, you would expect me to remind you not to discuss the case with each other, and we'll be back in approximately 45 minutes and we'll continue at that time.

The jury's excused for lunch.

(Whereupon, the jury left the courtroom.)

THE COURT: All right. The Court stands in recess for lunch.

(Lunch recess.)

THE COURT: Be seated, please.

Ms. Straka, are you prepared to continue your direct examination?

MS. STRAKA: Yes, Your Honor.

THE COURT: You may go to the podium.

While she's doing that, bring in the jury, please, Mr. Mitchell.

(Whereupon, the jury entered the courtroom.)

THE COURT: Welcome back from lunch, ladies and gentlemen. Please have a seat.

We'll continue with the direct examination of Mr. Teddy Davis by counsel for Nokia and AT&T.

Ms. Straka, you may continue.

MS. STRAKA: Thank you, Your Honor.
Can you bring up -- let's go to DDX 4.9.
Q. (BY MS. STRAKA) Mr. Davis, you were explaining how this figure worked at a high level and we were drilling down a bit. We talked about the PIM model before lunch. Can you explain how the PIM cancellation is done using this figure 1?
A. Yes, ma'am. So we receive the transmit signals in on the -- see if I can draw on this -- into this path from the sniffing of the TX port, and we see -- we receive the uplink on this path. The FPGA models the potential PIM in the FPGA, and it is subtracted from the uplink signal in the FPGA in the subtractor, and then the output is fed over to the Nahka ASIC once it's been cleaned up.
Q. And so what is the output of the GROOT FPGA?
A. The output is the actual cleaned received signal.
Q. That is the signal that the receiver is trying to receive?
A. Yes, ma'am.
Q. Looking at this figure, is there ever a passband of signals that includes both the downlink transmit signals and the received uplink signals?
A. No, ma'am.
Q. How can you tell that?
A. Well, there's two A to D, so they would be completely separate data streams.

Q. What is an A to D?
A. It stands for analog-to-digital converter.
Q. So can you describe -- again, what's highlighted in blue on this slide?
A. That is the receiver, or the uplink.
Q. And can you describe what the RF ADC within the blue path on DDX 4.9 is doing?
A. It's sampling the received uplink from an -- sampling the received analog uplink and then converting it to a digital signal.
Q. It goes into a box that says, UL signal, desired UL plus actual PIM. Can you describe what that means?
A. Since the PIM -- if there's any issues with the connectors or coaxes or antennas or whatever, those create the PIM that is falling into the receive band, so essentially what comes down on the receive band is the actual model -- or not the model, but the actual -- the actual PIM and the uplink. So they are essentially a contaminated signal from the antenna with the -- you know, the uplink and the PIM are actually on it.
Q. So that path that you circled in blue was in brown on the original diagram. Is that right?
A. Yes, ma'am.
Q. And the brown path and the red path, they both lead into -- it looks like it's a circle in the middle of the

diagram?
A. Yes, ma'am.
Q. What happens in the circle?
A. That's where the actual correction happens. That's where we take the uplink signal with the PIM on it and subtract the model off. And then the result of that is just the actual uplink or the desired uplink.
Q. Is there a figure in the documentation that discusses how the actual subtraction happens?
A. It's just that subtraction block in the middle there.
Q. Which block --
MS. STRAKA: Let's go to -- let's go to the next slide.
Q. (BY MS. STRAKA) If you look at the PIM engine or NL block, where does the subtraction happen on -- on this diagram?
A. Okay. So that is the post NL blocks here.
Q. I'm now on DDX 4.12. Is this a figure that shows what the post NL block looks like?
A. Yes, ma'am. At a high level, that's exactly what it shows.
Q. Can you describe what's happening here in the post NL block?
A. What it's showing is the input to the -- the inputs are on the left-hand side. The top four blocks are actual inputs

into the -- the filter. So the NL out is the actual model output of the NL blocks. The top three blocks are for configuring the filter.

And then the bottom blocks are the actual uplink receive signal with the PIM on it. And then those essentially go through those blocks and delays, and then they're subtracted at the subtractor here and then passed on to the Nahka as a corrected receive out after the correction has been completed.

Q. And you described earlier that it's the Nahka that's the baseband processor?

A. Yes, ma'am.

Q. Now, are you familiar in your job as an engineer with the term close loop and open loop?

A. Yes, ma'am.

Q. Can you describe for the jury what a close loop system is?

A. A close loop system is a control system that takes an error signal from the output, feeds it back to the input to try to make that error or try to make the output match what the input is or -- and just -- it tries to minimize the error.

Q. So in relation to that, what is an open loop system?

A. Open loop systems have no feedback mechanism. What comes in, goes out. There's no mechanism to feed the output back to the input to make any changes on it.

Q. Is the PIM-C feature in the Galaxy radios an open loop

system or a closed loop system?
A. It is completely open loop.
Q. Can you tell from this diagram that it's an open loop system?
A. There is no feedback mechanism going back into any of the blocks from the output.
Q. Why have the Galaxy radios been implemented using an open loop system?
A. The complexity didn't really warrant it, plus there's a timing issue between the receive and the PIM model. There would be -- it would just take way longer than what we have for the specifications in the error interfaces. So it just -- it was not functionally required to actually do close loop.
Q. Would it be practical to implement a close loop system for the cancellation done in the GROOT FPGA?
A. I don't believe it would be. It would require more resources that we don't have in the FPGA.
Q. Looking back again at this figure on DDX 4.10, in the bottom right-hand corner there is a green box, and it's labeled correlator. Do you see that?
A. Yes, ma'am.
Q. What is the correlator module and the GROOT FPGA used for?
A. It's -- at a high level, it's used for two things. It's

used for delay search, and it's also used for hardware accelerating calculations of the -- the terms needed to calculate the coefficients.

Q. Can you explain for the jury what you mean by delay search?

A. Yes. The delay between the uplink signal and the modeled signal based upon the transmit comes out first, and then it creates the PIM through the antennas or the cables or whatever, and then it's received. So you can imagine that the time it takes for that signal to get back into the radio, there's a time difference between the actual output and the uplink, and we have to then take that signal and model that PIM so there's a difference in time.

So essentially what the delay search does, it allows us to time align the model with the actual uplink so that when we do the cancellation, we're subtracting the correct values at the right time.

Q. Do you recall Doctor Wells discussing delay search?

A. Yes, ma'am.

Q. And he talked about a narrow delay search and a wide delay search. Do you recall that?

A. Yes, ma'am.

Q. Does the GROOT FPGA implement a narrow delay search and a wide delay search?

A. No, it does not.

Q. How does it do the delay search?
A. It's just a delay search. There's no distinguishing between narrow or wide. It's just a delay search.
Q. Have you seen documentation, Nokia documentation, that describes the narrow delay search and the wide delay search?
A. Yes, I have.
Q. And was the delay search implemented that way?
A. No, it was not.
Q. Why wasn't it implemented that way?
A. It was decided at the very beginning -- because this was all new to us, we weren't a hundred percent sure what we needed to do, and that's what we thought when we developed the algorithm.
But after spending, you know, months and years developing this, we realized that we didn't need to do a wide or a narrow delay search. We just needed to do a delay search.
Q. And so if I was reading the documentation and I wanted to confirm what type of delay search is done within the GROOT FPGA, where should I have looked to figure out those implementation details?
A. You should probably look at the code or the software. Either one of those would tell you what they're doing.
Q. And how do you know that it's just a single delay search that's implemented?
A. I know the implementor, and I discussed it with him ad

nauseam.

Q. Do you recall during Doctor Wells' portion of the presentation he referred to a section of the documentation that was labeled RX delay?

A. Yes, ma'am.

MS. STRAKA: Mr. Horseman, can you bring up PX 839? Page 42. That's not the right one.

Mr. Horseman, can you bring up Doctor Wells' demonstratives at slide 76? And can you just blow up this section of the thing that takes this figure 20 from PX 839 at 752?

Q. (BY MS. STRAKA) Can you describe what's being shown here in this figure that was on slide 76 of Doctor Wells' demonstratives?

A. This is the first round of implementations of the RX delay.

Q. Does this have anything to do with the delay search functionality that you were just talking about?

A. Not really. This is a static signal that gets set based upon the variant of the radio. So it never -- once the radio boots up, it never changes. So there is no reason for doing the delay search because it's a static value set at compiled time of the radio software.

Q. And is this RX delay performed at a subsample level?

A. Absolutely not. This is running at the sample rate of

the receiver. It never changes any sample rates.

Q. Is there anything in the correlator, the delay search, or this RX delay that changes what you told me about the GROOT FPGA being an open loop system?

A. No, ma'am.

Q. Earlier we were talking about how the radio cancels only internal PIM or line PIM.

A. Yes, ma'am.

Q. Why is it the case that the -- the GROOT FPGA only cancels line PIM?

A. It's mainly due to resources. We're very limited in the resources inside the FPGA. And it's a lot more complicated because you need, instead of just having one of those RF A to D sniffing the TX port, you have to have an RF A to D sniffing all of the antennas.

So you can imagine that the complexity gets a lot higher whenever you have to start sniffing every transmit port and doing a model for every antenna to every antenna. It would just be a nightmare as far as implementation goes.

Q. Has Nokia considered trying to cancel external PIM within the radio?

A. Not -- not really because it just -- like I said, the complexity is just -- it's just overwhelming how much more resources and how many more data converters you would need to actually do the job.

Q. Is it fair to say it wouldn't be practical to cancel air PIM in the radio?
A. It's not practical in the sense that it would just cost way more money and it just wouldn't -- it just -- you know, it could be done, but it just would be really, really expensive and I don't think they want to spend the money on doing that.
Q. Do you recall yesterday when Doctor Wells showed the jury the non-linear block within the GROOT FPGA?
A. Yes, ma'am.
MS. STRAKA: Mr. Horseman, can you bring up slide 64 from Doctor Wells' presentation?
Q. (BY MS. STRAKA) And he was referring here to PX 858 at 61 -- 2163 through 64.
Mr. Davis, is this how the non-linear block is implemented within the GROOT FPGA?
A. It's similar, but it's not exactly that, no, ma'am.
Q. And, again, how would I confirm how the non-linear block is actually implemented within the GROOT FPGA?
A. The easiest way to do it is just look at the code, but it's also documented in the architecture spec.
Q. And this document PX 858 --
MS. STRAKA: Can we bring up the cover of that document, Mr. Horseman?
Q. (BY MS. STRAKA) This document PX 858, this is not the GROOT architecture spec.

A. That is correct. This is software architecture spec for the algorithm that they run to actually implement PIM cancellation using the hardware.
Q. And the GROOT architecture spec is a document that we looked at earlier. Is that right?
A. Yes, ma'am.
Q. What is the GROOT architecture spec document used for?
A. It explains the internal block -- or it's the internal blocks of the PIM FPGA or the GROOT. It shows what each block does and kind of gives a description of the -- you know, the overall design, what we're trying to do and why we do what we do.
MS. STRAKA: And if you bring up DDX 4.11.
Q. (BY MS. STRAKA) This is a diagram from the GROOT architecture spec that we looked at earlier.
A. Yes, ma'am.
Q. Is this how the non-linear block is actually implemented in the GROOT FPGA?
A. Yes, ma'am.
MS. STRAKA: I'll pass the witness at this time.
THE COURT: All right. Is there cross examination by the Plaintiff?
MS. FAIR: Yes, Your Honor.
THE COURT: Proceed with cross examination. Distribute your binders, please.

Proceed when you're ready, Ms. Fair.

MS. FAIR: Thank you, Your Honor.

CROSS EXAMINATION

BY MS. FAIR:

Q. Good afternoon, Mr. Davis.

A. Good afternoon.

Q. We haven't met before. Right?

A. No, ma'am.

Q. I'm Andrea Fair. I'm Mr. Ward's law partner. It's nice to meet you?

A. Nice to meet you.

Q. And you know I represent Finesse in this case. Yes?

A. I assume so, yes, ma'am.

Q. Now, you're here today as Nokia's corporate representative at this trial. Right?

A. That's what I've been told.

Q. And so you're here to speak for the company.

A. I'm here to speak for the stuff that I know about the company, yes, ma'am.

Q. The stuff that you know. Right?

A. Yes, ma'am.

Q. Okay. So you testified on direct about the Nahka ASIC block on the diagram that we've been looking at. Right?

A. Yes, ma'am.

Q. Now, to be clear, you're the FPGA guy. Right?

A. Yes, ma'am.

MS. FAIR: Mr. Boles, can we please have DDX 4.7?

Q. (BY MS. FAIR) So the Nahka block is this one on the left. Right?

A. Yes, ma'am.

Q. And your work is in here in the middle. Right?

A. Yes, ma'am.

Q. That's the FPGA.

A. Yes, ma'am.

Q. You didn't really pay attention to what Nahka is doing. Right?

A. That's actually not true. I actually designed some of the circuits inside the Nahka ASIC.

Q. You remember being deposed in this case?

A. Yes, ma'am.

Q. You were actually deposed twice in this case. Right?

A. Yes, ma'am.

Q. And you should have a copy of your depositions in the front pocket of the binder there.

A. Okay.

Q. You were under oath at that deposition?

A. Yes, ma'am.

Q. So if you'll look in the August deposition. It should be in the front pocket --

A. Okay.

Q. -- I believe.
A. I see. Okay.
Q. You'll flip to page 115, please.
A. Okay.
Q. And if you'll look at lines 6 through 15 and let me know when you're finished.
A. Lines which ones?
Q. 6 through 15.
A. Yes. Okay.
Q. So you don't know that you actually paid that much attention to what Nahka was doing because you were doing an FPGA. Right?
A. I mentioned in this deposition of the TxRxCc blocks. I'm not talking about the TxRxCc blocks now.
Q. And you were talking to us about DX 858 at the end of your direct. Right?
A. I assume so.
Q. That was the algorithm. You remember seeing the architecture that was the algorithm?
A. Yes.
Q. Okay. You've never looked at that source code. Right?
A. I've never looked at the software source code, no, ma'am.
Q. And you've never -- or I guess it's been several years since you've looked at the code for ASIC. Right?
A. Yes, ma'am.

Q. You also were telling the jury about whether or not there is delay?
A. Yes, ma'am.
Q. Whether or not the PIM detection implemented by Galaxy has delays as part of that system. Right?
A. Yes, ma'am.
Q. You just testified about that to the jury?
A. Yes.
Q. But you're not really the software guy that wrote it, so that's who we'd have to talk to get the real answer. Right?
A. No, you don't. I don't agree with that at all.
Q. Can you turn to page 141 of your deposition, please?
A. Okay.
Q. And if you'd start reading at line 17 through the first line on the next page.
A. Okay.
Q. You were asked whether the PIM detection implemented by Galaxy has delays as part of the system.
And you said, I don't believe so. I think it's just to determine if there's PIM or not. But I'm not the software guy that wrote it so you'd have to talk to them to get the real answer.
Right?
A. Evidently that's what I said, yes.
Q. And just to be clear, you're not here to testify about

infringement in this case. Right, Mr. Davis?
A. I don't believe so.
Q. You're not here to analyze the claims. Right?
A. I don't think I am.
Q. You're not here to tell us whether or not any particular limitation is met?
A. I don't guess I am.
Q. And you're not here to testify about damages, either. Right?
A. No, ma'am.
Q. When did you get into town?
A. It was Monday afternoon.
Q. And I assume you spent time preparing to testify today?
A. Yes, ma'am.
Q. Now, I don't want to know anything that was said, but you spent some time with lawyers getting ready?
A. Yes, ma'am.
Q. And this is an important case. Right?
A. Absolutely.
Q. And you take it seriously?
A. Yes, ma'am.
Q. How long did you spend preparing?
A. I -- I don't really have an idea of how long it was. It was many days, several weeks of...
Q. I don't want to know what was said again, but were any of

AT&T's lawyers there?
A. I don't believe so.
Q. Now, AT&T and Nokia, they do a lot of business together. Right?
A. I'm assuming they do. I'm not privy to that information, so I'm sure they do.
Q. Well, you were here in the courtroom earlier when we heard Mr. Loddeke tell us that it's billions of dollars in business between the two. Right?
A. Yeah, I guess so. Like I say, I'm an engineer. I don't deal with finances. So I don't know how much money they spend.
Q. Mr. Davis, Nokia supplies -- you told us on direct about how Nokia is an equipment supplier for cellular networks. Right?
A. Yes.
Q. And you're one of the main two suppliers out there. Right?
A. I would think so, yes, ma'am.
Q. Ericsson being the other.
A. Yes, ma'am.
Q. And AT&T is one of the three largest carriers in the United States. Right, sir?
A. Yes, ma'am.
Q. And so you would imagine that AT&T has a pretty important

customer to Nokia. Right?
A. I would think so, yes, ma'am.
Q. Because AT&T has choices. Right?
A. Sure.
Q. And part of the reason that Nokia is here is because AT&T has demanded that your company cover their costs based on a contractual agreement between the companies. Right?
A. I have no idea about contractual agreements between AT&T and Nokia.
Q. So you, sitting here today as the representative of Nokia, can't tell us whether or not you've been -- a demand has been made on your company by AT&T to cover the costs of this litigation?
A. I cannot because I'm not privy to that information.
Q. You understand what indemnity is. Right? You've heard of it?
A. I've heard of it yes, ma'am.
Q. Would it surprise you if you found out that in the contractual agreement between these two companies, there was an indemnity agreement where Nokia is covering the costs or has been asked to cover the costs of this litigation?
A. I don't think it would surprise me, but I don't know that it's there or not.
Q. Outside of the courtroom, the business relationship between these two parties, we heard about Nokia, when it

builds products for AT&T, there's discussions that happen between the two. Right?

A. I would say, yes, there probably is.

Q. I mean, it's not a situation where Nokia makes products that are just out on the shelf and AT&T goes and buys them. Right?

A. Sometimes that does happen, yes.

Q. That's not what happened in this case, is it?

A. I don't have any idea how the contract negotiations or how the products were specified by AT&T or Nokia.

MS. FAIR: Mr. Boles, can we please have PX 646?

Q. (BY MS. FAIR) You remember seeing this exhibit earlier with Mr. Loddeke?

A. Yes, ma'am.

MS. FAIR: And if we scroll to the very last page at the bottom. I'm sorry, one page up. Thank you, Mr. Boles.

Q. (BY MS. FAIR) We see that this is from July of 2018. Do you see that?

A. Yes, ma'am.

Q. And they're talking about a short meeting to discuss and develop ideas around the key feature/parameter opportunity for B7[sic] -- that's band 17. Right?

A. Yes, ma'am.

Q. -- PIM impact mitigation?

A. That's what it says, yes, ma'am.

Q. And then if we scroll -- so they're having a meeting. If we scroll up to the email right above that, we see it's from Mr. Richard Caine of AT&T. Do you see that?
A. Yes, ma'am.
Q. To folks at Nokia and AT&T?
A. Sure.
Q. Do you see that?
A. Yes, ma'am.
Q. And he says, here's the points we discussed, Mr. Caine does. Do you see that?
A. Yes, ma'am.
Q. And so we're having an exchange here, there was a meeting, there's discussions between AT&T and Nokia. Right?
A. Yes, ma'am.
MS. FAIR: And if we keep scrolling up in the chain, Mr. Boles.
Q. (BY MS. FAIR) We see several emails back and forth about band 14 PIM impact to band 17 mitigation. Right?
A. Yes, ma'am.
Q. And who knows how many phone calls are happening between these folks. Right?
A. I have no idea. I was not involved in any of those phone calls.
Q. If we go to the very top, the first thing, the first email, I guess it would be the last email in the chain, is we

see, We'll discuss some more internally and get back to you. I think there'll be a lot of trial and error for us to find what works best once we start getting a large number of band 14 sectors on air.

Do you see that?

A. Yes, ma'am.

Q. That's from Mr. Jason Carter at AT&T?

A. That's what it looks like, yes, ma'am.

Q. And when Mr. Carter is writing back to Nokia and they're struggling with this PIM impact problem, he doesn't say, you know what? We've got this solved; we have site hygiene.

He doesn't say that, does he?

A. This was really the first time I've looked at these documents, so it doesn't say that, no, it does not.

Q. And he also doesn't say, thanks, Nokia, but PIM's really not a problem for us, we don't really need any help for that, thanks for offering solutions, but we don't need them, we don't have a problem.

A. It doesn't look like he said that, no.

Q. Do you know Mr. Brewer?

A. I do not.

Q. Well, I'll represent to you he testified by deposition on Monday of this week, and he told us about -- talked about a commercial proposal and that he meets with AT&T's CTO and has discussions with them often before they make these commercial

proposals.

MS. FAIR: Mr. Boles, can we please have PX 995?

Q. (BY MS. FAIR) And you see this is a commercial proposal for B12, B14, B29 tri-band RRH. That's a tri-band remote radio head that operates on band 12, band 14, band 29. Right?

A. Yes, ma'am.

Q. And this is a document Nokia prepared?

A. Sure looks like it, yes, ma'am.

MS. FAIR: And if we go to the next page, Mr. Boles.

Q. (BY MS. FAIR) We see that on the second bullet point, the best return on investment from AT&T's purchase of B29, that's band 29, spectrum can be realized with B12, B14, B29. That's the tri-band radio that we're talking about in this case. Right?

A. I assume so, yes, ma'am.

Q. The AHLBBA. Right?

A. Yes, ma'am.

Q. And it says -- this presentation that Nokia made says, Band 29 spectrum, right underneath, is not financially attractive to deploy with SB B29 RRH. That's single band, band 29, remote radio head. Right?

A. I didn't write this document, so I -- if you say it means single band, I guess that means single band. I don't know for sure.

Q. It says, tower leasing costs are typically too high.

Right?

A. Yes, ma'am.

Q. And so if you have three single-band radios, it's going to take up more space than a single tri-band radio. Right?

A. Yes, maybe. Maybe. It just depends on the size of the radios.

Q. But with a tri-band radio, what Nokia is telling AT&T is that you have lower tower and site leasing costs, two bullets down there. Right?

A. Sure. I don't know how they price tower space. If that's what they say, that's what they say. I don't know. I don't know that stuff.

Q. Well, Mr. Davis, it wouldn't surprise you, would it, if you take up more space on a tower, you have to pay more for it?

A. I'm not sure that you take up more space.

Q. Well, it certainly is Nokia telling AT&T here that they can have lower tower and site leasing costs for band 12, band 14, band 29 versus two remote radio heads. Right?

A. Sure. That's what it looks like it says, yes, ma'am.

Q. And you get lower deployment costs, too. It reduces the lines, the cables, the radio frequency jumpers. Right?

A. That's what this document says, yes, ma'am.

Q. And you also think the reason for moving to multiband radios is because it's cheaper.

A. I don't know that I have an opinion what -- if moving to multibands is cheaper or not. I've never really even thought about it. But it might be.
Q. You think it's a lot cheaper to do as a multiband radio rather than two and two. Right?
A. Yes, actually I probably do agree with that, now that I think about it a little more.
Q. Did you know before earlier today or yesterday that AT&T had been looking for a solution to maximize its use of band 29 spectrum?
A. No, ma'am, I was not aware of that.
Q. And we see at the bottom that the five megahertz band 29 transmit adds up to 50 megabits per second to enhance AT&T's competitiveness. Do you see that?
A. Yes, ma'am.
Q. Adding five megahertz band 29, right underneath that bullet there, adding five megahertz band 29 TX -- that's transmit, right?
A. Yes, ma'am.
Q. -- operation to an existing site with 10 megahertz carrier increases T-put -- that's throughput, right?
A. Yes, ma'am.
Q. -- by 50 percent. Do you see that?
A. Yes, ma'am.
Q. So Nokia is telling AT&T that if they add five megahertz

of band 29 transmit, that's sending stuff to the phone--right?--talking about downlink here --
A. Yes.
Q. -- you can increase your throughput by 50 percent. Right?
A. Yeah, that makes sense. Add more bandwidth, you get higher throughput, sure.
Q. Yeah. And if you can use that bandwidth, then you're able to salvage that spectrum, aren't you?
A. I wouldn't say that's what this says, no.
Q. Well, we saw at the top that AT&T purchased band 29 spectrum. Right?
A. Sure. But there's nothing in here that says about salvaging anything.
Q. And we say that it's cheaper for them to do a tri-band radio to deploy that band 29 spectrum. Right? That's at least what Nokia's telling them.
A. Sure. It doesn't say anything about salvaging anything, though.
Q. It does say, though, that there is a problem that Nokia has fixed. Right?
A. It says there's built-in PIM cancellation, yes.
Q. To cancel the wired PIM between the three bands and the remote radio head. Right?
A. Yes, ma'am.

Q. Nokia wasn't telling AT&T, you know what, there's this PIM problem when you add band 29, but you can just use site hygiene for it, were they?
A. I don't know if that's what they're telling, I'm not -- like I say, I'm not privy to anything they told AT&T, I mean, other than what's in this document.
Q. Certainly not in this document. They aren't saying, you don't need our PIM cancellation, just use our site hygiene. Right?
A. I'm not sure if this is a proposal for them or not. I'm not sure the whole -- I'm not sure what this document is actually used for.
Q. Let's talk a little bit about why Nokia has PIM-C on its radios.
MS. FAIR: Let's pull up -- let's do DX 103, Mr. Boles, which I believe is the same as PX 999.
Q. (BY MS. FAIR) This is another Nokia document. Right?
A. Yes, ma'am.
Q. It's from 2018?
A. It looks like it.
Q. And we can all agree that 2018 is a long time after 2001. Right?
A. Yes.
Q. This document's talking about PIM cancellation for AirScale dual band radios. Do you see that?

A. Yes, ma'am.
Q. And do you know Mr. Calloway?
A. No, I do not.
Q. Well, I'll represent to you that we heard him testify by deposition on Monday as well, and he's a cell system engineer at Nokia who regularly meets and corresponds with them. And he remembered watching this presentation.
Now, you don't have any reason to dispute that he told us that it's the feature -- this is the feature designation of PIM cancellation for the AirScale dual band radios. Right?
A. That's -- yeah, that's what it says.
Q. And if we go to page 3, the title of this section is Motivation. Do you see that?
A. Yes, ma'am.
Q. So you talked a lot on direct about how PIM cancellation works, whether it was inside the FPGA box that you're the guy for or not, but we didn't talk a lot about why, did we?
A. No.
Q. Now, motivation is the why we do things. Right?
A. Sure.
Q. Do you think the next page of this is going to say the motivation is because AT&T doesn't have a PIM problem, that's why Nokia's coming up with a PIM cancellation solution?
A. I don't remember what the next page says so I can't -- I'm not going to speculate.

Q. You think it might say that?
A. I don't know what it says.
MS. FAIR: Mr. Boles, can we have the next page, please?
Q. (BY MS. FAIR) We see at the top, The RAN evolution is made more effective using new Nokia AirScale remote radio heads. Right?
A. That's what it says.
Q. And this is in 2018?
A. Sure.
Q. We saw that on the first page?
A. Uh-huh.
Q. I'm sorry. Is that a yes?
A. Yes, ma'am.
Q. And Nokia is saying that these new AirScale radios enable carrier configurations on one antenna that were previously restricted. Right?
A. That's what it says, yes.
Q. And if we look over to the right in the big arrow, we see the benefits of new AirScale radios. Do you see that?
A. Yes, ma'am.
Q. And one of the benefits that's listed here is that it eliminates separate single-band radios by combining bands 14 and band 12 and band 25, band 26 [sic] into dual band radios. Right?

A. No. You said band 26.
Q. I'm sorry. Thank you for letting me know that. So let's try that again.
It eliminates separate single-band radios by combining band 12 and band 14 and band 25 and band 66 into dual band radios. Right?
A. Yes, ma'am.
Q. And those are the same dual band combinations we're talking about in this case. Right?
A. I believe so, yes, ma'am.
Q. The AHLBA combines bands 12 and 14, and the AHFIB combines bands 25 and 66. Right?
A. I believe that's the case, yes, ma'am.
Q. And these benefits in this arrow are pointing down to modernizing the cell site. And two items listed under modernizing the cell site are less radios and less antennas. Do you see that?
A. Yes, ma'am.
Q. If we go to the next page, we see here several features, specifications, what we can know about the supported frequency bands, the frequencies, the number of ports, output power, dimensions, these sorts of features of the AHLBA radio. Right?
A. That's what it looks like, yes, ma'am.
Q. But the feature that's called out to the right underneath

the pictures of the radios is that they include PIM cancellation. Do you see that?
A. Yes, ma'am.
Q. And if we go to the next page, the AHFIB, it's the same thing. PIM cancellation is the feature that's called out to the right. Right?
A. Amongst many, yes.
Q. Amongst two that are called out to the right.
A. Oh, yes, to the right, yes, ma'am.
Q. The other one being that it's 5G ready. Right?
A. Yes.
Q. So of the two features that Nokia chose to point out, includes PIM cancellation as one of them. Right?
A. I wouldn't say that they chose to feature that. There's a bunch of specs over here on the left-hand side that are featured also.
Q. The one that they chose to take out of the table and put on the right right there under the picture is, includes PIM cancellation. Right?
A. I'm not sure the motivation of why they did that, but yes.
Q. If we go to page 7, this is what you were talking about and what we've heard a lot about is air PIM versus line PIM. Do you remember talking about that?
A. Yes, ma'am.

Q. And that's this idea of external versus internal PIM. Right?
A. Yes, ma'am.
Q. And we've heard a lot over the last few days, your lawyers have spent a lot of time in this trial talking about external PIM and saying the PIM cancellation in this case doesn't fix that problem. Right?
A. Yes, ma'am.
Q. I mean, it sounds almost like it should be a get-out-of-jail-free card.
A. I don't know that I would characterize that that way.
Q. You know that we agree with that. Right?
A. I don't know what you agree with.
Q. You know that Finesse is not trying to say that this technology cancels external PIM. Right?
A. I'm not sure. Like I said, I'm not sure what you're trying to prove.
Q. Okay.
MS. FAIR: If we go to the next -- I believe it's page 9, Mr. Boles.
Q. (BY MS. FAIR) Here is an explanation of air versus line PIM. Right?
A. Yes, ma'am.
Q. And we see the bottom of the bigger bullets here. It says, many LTE frequency bands can produce PIMs with transmit

carriers either across bands or within the same band. Right?
A. Yes.
Q. And the first example is band 12 and 14 transmit carriers, they can interact to create PIMs that appear in both band 12 and band 14 RX. That's receive. Right?
A. Yes, ma'am.
Q. And so if the radios transmitting on these two bands are two single-band radios on the same tower and there were PIM, it would be external PIM. Right?
A. Can you say that again?
Q. If you had two single-band radios, one is transmitting on band 14, one's transmitting on band 12, and there's PIM being caused as described here, it would be external PIM. Right? Because we have two radios.
A. Not necessarily.
Q. If you put all of them together into a single dual-band radio, it's all going to be internal PIM. Right?
A. Sure. But if you have two separate radios going to the same antenna, you can get internal PIM.
Q. And you can also make what would be external PIM internal PIM if you do a single multiband radio, can't you?
A. Say that again?
Q. You can also take what would be external PIM if there were multiple radios and if you put it all in one radio, it becomes internal PIM. You can move some of the PIM inside the

radio by putting more components together, putting more bands together.

A. In general, adding more carriers can create PIM or it can create measurable PIM or it may not create measurable PIM. It just depends on the components and stuff that you use in the actual antenna lines.

MS. FAIR: Mr. Boles, can we go to page 11, please?

Q. (BY MS. FAIR) So here Nokia is telling us about the line PIM cancellation solution that they've come up with. Right? This is in the same presentation.

A. Yes, ma'am.

Q. So about to tell us the solution. What do you think will be on the next page, Mr. Davis?

A. Probably the solution.

Q. You think it will be site hygiene?

A. I don't know. Site hygiene is not what we're selling.

Q. Do you think it will say, we don't need line PIM cancellation because we found the cure? We'll send people out to fix it?

A. Probably not.

Q. Do you think it will say, we've got a solution that will help you find what's broken?

A. I'm not sure what it will say.

MS. FAIR: Can we go to the next slide, Mr. Boles?

Q. (BY MS. FAIR) This is the technical details of the PIM

cancellation functionality that's at issue in this case, isn't it, Mr. Davis?
A. It looks like a high-level version of it, yes, ma'am.
Q. Now, we've been hearing -- I want to talk about PIM in general. We've been hearing AT&T and Nokia tell this jury that PIM really isn't a problem. Right?
A. Yes, ma'am.
Q. And we heard your lawyers yesterday say there's data that proves that this internal PIM is present in substantially less than two percent of the radios at any given time. Do you remember hearing that?
A. Yes, ma'am.
Q. We heard a little bit about that snapshot of data earlier. Right?
A. Yes, ma'am.
Q. Now, it seems like they've suggested it's because AT&T has such good site hygiene. Right?
A. That's what they inferred, yes, ma'am.
MS. FAIR: Mr. Boles, can we have PX 911, please?
Q. (BY MS. FAIR) This is a Nokia document. Do you see that?
A. Yes, ma'am.
Q. It is talking about -- or it's a requirements document. Right?
A. That's what it looks like.

Q. And this one is section 2 on PIM. Right? For the architecture requirements.

A. Yes, ma'am. It's the first time I've ever seen this document, so bear with me.

Q. It's in your notebook if you would like to look at it. It should be under the tab PX 911.

A. Okay. Go on.

Q. If we go to page 2 -- and, by the way, this excerpt that's going to be the exhibit in this trial is only four pages, but this is originally a 96-page document. Do you see that, Mr. Davis? Down there at the bottom, we see it's page 8 out of 96?

A. Sure.

Q. And it's about PIM. Right? PIM cancellation.

A. Yes, I guess. Like I say, I've never seen this document. So if that's what you say it is, I have to agree or I'll have to defer to you on that one.

Q. Well, it's the title of the document, Mr. Davis. You saw that, right?

A. It says Software Algorithm for Section 2.

Q. Which is PIM.

A. Okay. I don't know if the whole 6 pages is for PIM or other software algorithm stuff in it. This is the first time I've ever seen this document.

THE COURT: You have to speak up, Mr. Davis, so we

can hear you.

THE WITNESS: Sorry, Your Honor.

Like I say, this is the first I've ever seen this document so I can't really comment on if it's all about PIM algorithms or anything else. I've never seen this document before.

Q. (BY MS. FAIR) You're the engineer that Nokia brought to explain how PIM works and you haven't seen the architecture requirements document, the section that talks about PIM before? This is the first time you've seen it?

A. Absolutely. I don't do that stuff. I'm a hardware engineer. I'm not software algorithm guy.

Q. You're the FPGA guy.

A. Yes, ma'am.

Q. All right. If we go to page 2, we see the heading Passive Intermodulation Cancellation and Detection. Right?

A. Yes, ma'am.

Q. And that first sentence there, it says, Passive intermodulation creates tremendous problems for the wireless industry. Do you see that?

A. Yes, ma'am.

Q. And this is Nokia saying this. Right?

A. It looks like a Nokia document, yes, ma'am.

Q. And then that same paragraph, it goes on to say, The PIM cancellation feature will be extremely useful providing a

powerful product differentiator for Nokia. Right? Do you see that?
A. Yes, ma'am.
Q. And this is the best and the brightest engineers, we heard earlier this week, at Nokia. Right?
A. I don't know who wrote this document. I don't know who did it. So I can't say they're best and brightest because I don't know who did it.
Q. Are some of the engineers at Nokia not the best and brightest?
A. I wouldn't -- I don't even know if an engineer wrote this, so I can't really comment on it.
Q. We've also heard about the effectiveness of this PIM-C technology. We heard, in fact, just a little bit ago Mr. Taylor said, sometimes it's a little bit effective and sometimes it just doesn't seem to be that effective at all.
Nokia called this product GROOT. Right?
A. The FPGA is called GROOT. Yes, ma'am.
Q. Getting rid of offending signals. Right?
A. No, ma'am.
Q. GROOT does not stand for getting rid of offending signals?
A. No, it does not.
Q. What does it stand for?
A. It stands for getting rid of offending tones.

Q. Tones. Now, you named it that to show what's the real purpose. Right?
A. No. It was just a play on the name GROOT. We just made it fit.
MS. FAIR: Your Honor, may I have leave to get my tablet with the transcript from a little bit ago?
THE COURT: You may.
Q. (BY MS. FAIR) You testified on direct that, as an engineer, you like to make acronyms for things. So you decided, just to kind of make an acronym that meant something, you called it getting rid of offending tones to, you know, make it something that we could talk about and kind of show the actual real purpose of the FPGA. Right?
A. Sure.
Q. That's what you just said on the stand earlier.
A. Sure.
Q. Let's talk about whether or not that functionality works, or at least what the Nokia says about it.
MS. FAIR: Mr. Boles, can we have PX 862?
Q. (BY MS. FAIR) This is a data sheet for one of the accused products, the AHFIB. Do you see that?
A. Yes, ma'am.
Q. And a data sheet is something that's customer-facing. Right?
A. I assume so, yes, ma'am.

Q. And if we look at the first paragraph that's describing the AHFIB product, it says, the radio integrated passive intermodulation cancellation delivers enhanced network performance. Do you see that?
A. Yes, ma'am.
Q. Nokia's telling its customers, this is going to make your network perform better. Right?
A. I guess it's kind of blurry to me if they're talking about the PIM or if the whole radio itself.
MS. FAIR: PX 867, Mr. Boles, please.
Q. (BY MS. FAIR) This is the Nokia data sheet for the AHLBA radio. Do you see that?
A. Yes, ma'am.
Q. And it says the same thing--Nokia's unique book mounting enables faster rollout while the radio integrated passive intermodulation cancellation delivers enhanced network performance. Do you see that?
A. Yeah, I guess now that I read it a little bit better, it makes more sense, yes.
MS. FAIR: And if we go to PX 450, Mr. Boles.
Q. (BY MS. FAIR) This is -- you see at the bottom there, it's got a URL?
A. Sure.
Q. It's from Nokia.com?
A. Okay.

Q. Does that look like Nokia's website?
A. Yes, ma'am.
Q. And this is -- this page is about the AirScale radio. We see that heading at the top?
A. Yes, ma'am.
Q. And the AirScale radios, the three accused radios in this case are part of that broad portfolio of AirScale radios. Right?
A. I believe they are, yes, ma'am.
Q. And if we go to page 4, we see the heading Integrated Passive Intermodulation Cancellation. Do you see that?
A. Yes, ma'am.
Q. AirScale radios integrate the very latest design innovations and technology. And the example that's given that Nokia chose to put on its website is, Many radios directly integrate Nokia unique features, such as passive intermodulation cancellation, to deliver high performance at all times, without the need for additional hardware.
That's what Nokia is putting on its website.
A. Sure.
Q. When customers like AT&T came to Nokia and said, hey, we'd like these radios, did Nokia tell them, you know what? This PIM cancellation, it just doesn't really work?
A. I don't know what they told them. I wasn't involved in any talks with AT&T.

Q. Would you expect that's what Nokia would have told AT&T?
A. I wouldn't expect it, but I don't know what they actually did or not.
Q. And certainly Nokia tests features when it develops them and puts them in their radios. Right?
A. Yes, ma'am.
Q. I mean, and you agree that the PIM cancellation does its job. You don't know if there's anything out there that's better, do you?
A. I don't know if there's anything out there that's better, no, ma'am.
MS. FAIR: Thank you, Mr. Boles. We can take that down.
Q. (BY MS. FAIR) You testified on direct that you have two patents, I think it was?
A. Yes, ma'am.
Q. Are you proud of those?
A. Yeah, a little bit, yes, ma'am.
Q. I mean, it's a big deal to be a named inventor on a patent. Right?
A. Yes, ma'am.
Q. And there is a process involved with getting patents. Right?
A. Yes, ma'am.
Q. It takes time?

A. Yes, ma'am.
Q. Both engineer time, lawyer time? Right?
A. Yes, ma'am.
Q. Back and forth with the Patent and Trademark Office?
A. I'm assuming it does. I didn't do that portion myself, but I assume it did.
Q. It took time for your company to do that. Right?
A. Sure.
Q. Did you know during opening that your lawyer said that of the more than 10 million patents the U.S. Patent and Trademark Office has issued, very few of them are worth any, if much, money. Did you know about that?
A. I have -- I didn't hear that, no, ma'am.
Q. Do you think that Nokia would keep expending the resources going back to the PTO for more and more patents if very few, if any, are worth any money at all?
A. I'm not going to speculate what the -- I don't think they would, but it's not -- that's an opinion, it's not a fact.
Q. Would you agree with it?
A. I'm not sure that I would -- it just depends on how much it costs. I mean, I'm not in the position to do this. So I -- I guess there's a cost benefit analysis they run on it to figure out if they need to pursue it or not.
Q. You don't think Nokia would pursue patents if they didn't think they were valuable, do you?

A. I know for a fact that they turned down patents for some things and some things they haven't. So I can't a hundred percent say that they would or wouldn't because I've seen it both ways.

MS. FAIR: I'll pass the witness, Your Honor.

THE COURT: Redirect by the Defendant and Intervenor?

MS. STRAKA: Yes, Your Honor.

THE COURT: All right. Proceed with redirect.

REDIRECT EXAMINATION

BY MS. STRAKA:

Q. Mr. Davis, Ms. Fair asked you about a number of reasons why you're not here today. Do you recall that?

A. Yes, ma'am.

Q. Can you explain for the jury again why you are the person that is here today to talk about the PIM-C feature?

A. I was the one that actually implemented it, so I know the most about the FPGA in the company.

Q. How many people worked on the PIM-C feature at Nokia?

A. There's probably maybe three--two or three actual implementors and another guy that did verification.

Q. You just said you are the one who probably knows more about it than anyone at Nokia?

A. Yes, ma'am, because I wrote probably 80 percent of the code.

Q. And does the PIM-C feature work?
A. If there is PIM, it can work, yes, absolutely. It works whenever there's -- whenever you're in the right edges of the bands, right in the -- you know, if you have the high or high enough PIM where it actually needs to, it does work, yes.
Q. And so you're talking about certain circumstances that may affect how it works. What are the different factors that affect how the PIM-C feature in the radio work?
A. There is -- tX power level is one. That can cause -- if you have a higher power level, you can have more PIM. The band combinations can create more PIM. And then the external factors that we all talked about, the antenna lines, the antennas, the connectors, those kind of things, those can all affect PIM. So there's multiple things that can actually create it or exacerbate it, one.
Q. You heard some of the discussion about site hygiene?
A. Yes, ma'am.
Q. How does site hygiene relate to the amount of PIM on a base station?
A. It -- it lowers the occurrence of the PIM to like they were talking about earlier, that it lowers it down below the noise floor. You never can really get rid of it. It's always there. It's just the level may be so low, that it doesn't really affect anything. So you don't have to worry about it if the level is so low.

Q. And if the level is so low, does the PIM cancellation function actually have any throughput improvement on the radio?
A. No, ma'am, it does nothing. The software algorithm looks at the -- if there's -- if there's no PIM, it does nothing to the signal.
Q. What if the PIM source is really -- a really high PIM source? Can the PIM-C software feature in the radio fix the PIM?
A. It just depends on the level. There is an upper limit that we have where if you get -- the PIM is too high, it can't do anything about it.
Q. So it's fair to say there's a range where the software feature does correct PIM. Is that right?
A. There is a range, yes, ma'am. It's mainly -- it's a hardware limitation, not a software limitation.
Q. Also during Ms. Fair's cross examination, she asked you some questions about band 29 and it being five megahertz. Do you recall that?
A. Yes, ma'am.
Q. Did that increase in throughput have anything to do with the throughput improvement because of the PIM-C feature?
A. I really don't think it did. I think it was just adding more be bandwidth added the extra throughput.
Q. And when you add more bandwidth, you're going to get more

throughput.

A. That's usually the way it works yes, ma'am.

MS. STRAKA: Mr. Horseman, can you bring up PX 911?

Q. (BY MS. STRAKA) You testified on cross examination that you're not familiar with this specification. Can you zoom in on the part that is just under the title here, it says, passing on or copying this document? And it says, Alcatel-Lucent there.

A. Yes, ma'am.

Q. Do you understand that Alcatel-Lucent had a radio that had a PIM-C feature on it?

MS. FAIR: Objection, leading.

THE COURT: Sustained.

Q. (BY MS. STRAKA) Mr. Davis, are you aware of whether there was an Alcatel-Lucent radio that had a PIM-C feature on it?

A. I believe there was, but I'm not a hundred percent sure because I didn't ever work for Alcatel-Lucent. I always worked for Nokia.

Q. And this particular document says, Architecture Requirements Document ARD for Asset 1.0 RRH, algorithm SW, section 2-PIM.

Does this software algorithm specification have anything to do with the Galaxy radios that are accused in this case.

A. Like I say, I've never seen this document so I can't

really comment if it does or doesn't.
Q. And you're one of the three people at Nokia that work on the Galaxy radios. Right?
A. I work on the hardware portion of the Galaxy radio FPGA.
Q. In your work, you've never seen this architecture requirements document in relation to the Galaxy radios?
A. No, ma'am.
Q. If we turn to the second page of this document, going to section 1.6, the function overview. Ms. Fair showed you this portion of the document?
A. Yes, ma'am.
Q. And it talks about how passive intermodulation creates problems in the wireless industry?
A. Yes, ma'am.
Q. And she highlighted the sentence that started with while, while the PIM cancellation feature will be extremely useful, providing a powerful product differentiator for Nokia, and she stopped there. Do you recall that?
A. Yes, ma'am.
Q. After that, it says, this feature will not eliminate all PIM under all circumstances. Do you see that?
A. Yes, ma'am.
Q. Is that true also for the Galaxy radio?
A. Yes, ma'am.
Q. And in what circumstances will it not eliminate PIM?

A. If the PIM level is too high or if it's air PIM, those are two things that would cause it to not do anything.

MS. STRAKA: I'll pass the witness.

THE COURT: Further cross examination?

MS. FAIR: No, Your Honor.

THE COURT: You may step down, Mr. Davis.

THE WITNESS: Thank you, Your Honor.

THE COURT: You're welcome.

Defendant and Intervenor, call your next witness.

MR. NELSON: Thank you, Your Honor. Your Honor, at this time we would like to call Mr. James Proctor to the stand.

THE COURT: All right. Mr. Proctor, if you'll come forward and be sworn.

(Whereupon, the oath was administered by the Clerk.)

THE COURT: Have a seat at the witness stand, please, sir.

Mr. Nelson, you indicated the direct on this witness may be something close to two hours?

MR. NELSON: I would say.

THE COURT: We'll take a recess somewhere along the way. We're not going to wait, but we won't recess right now.

MR. NELSON: Okay.

THE COURT: All right?

MR. NELSON: Thank you very much, Your Honor. May

we have a moment, though, to pass out the binders?

THE COURT: Certainly.

MR. NELSON: Thank you.

THE COURT: All right. Mr. Nelson, you may proceed with direct examination.

MR. NELSON: Thank you, Your Honor.

JAMES PROCTOR SWORN,

testified under oath as follows:

DIRECT EXAMINATION

By Mr. Nelson:

Q. Good afternoon, sir.

A. Good afternoon.

Q. Can you please introduce yourself to the jury?

A. I'm Jim Proctor, James Proctor.

Q. Sir, can you tell us why you're here today?

A. Yes. I've been asked to provide opinions in this case related to infringement and validity of the patents that are at issue here.

Q. Okay. And when you say infringement, did you analyze any particular products?

A. I did. I analyzed the three products, the remote radio heads that have been discussed here.

Q. Okay. Now, sir, did you prepare a presentation to help us with the testimony today?

A. Yes, sir, I did.

Q. All right.

MR. NELSON: So that would be DDX 5 for the record.

Q. (BY MR. NELSON) So what I'd like to do is explore your educational background first. Can you tell us what your educational background is, sir?

A. Sure. So I got an undergraduate degree from the University of Florida in Gainesville, Florida, and then I got a master's in electrical engineering focusing on digital signal processing and communication theory from Georgia Tech Institute or Georgia Institute of Technology in Atlanta, Georgia.

And then I have taken lots of course work after that as well.

Q. So, sir, then after you graduated from Georgia Tech, did you start to work in the wireless communications industry?

A. I did. In fact, I was working in the wireless communication industry prior to graduating. I worked, interned at Harris Corporation from basically the summer before college all the way through graduate work in various areas, including wireless.

Q. And about how long have you worked in the wireless industry?

A. Well, let's see. I got married about six months after graduate school, and in March we'll be married 30 years. So a little over 30 years then.

Q. Now, sir, are you an inventor on any United States patents?

A. I am. Over my career, I've had the opportunity to get to solve lots of really interesting problems in the wireless space. And so I've been lucky enough to work with a lot of people and come up with some interesting ideas, and I'm a named inventor on over 320 issued U.S. patents.

Q. Now, let's talk about some of the professional experience you've had. So you mentioned Harris Corporation. Is it Harris Corporation?

A. Yes.

Q. Okay. Harris Corporation. Can you tell us what you did at Harris Corporation?

A. Sure. At Harris, this is '92 to '95. I actually started there in '86 after high school, as I mentioned. But after graduate school, working there, I worked on communication systems equipment that we deployed with federal law enforcement and the U.S. Army.

In fact, we built products that would allow you to go chase bad guys. I literally got the opportunity to play hide-and-go-seek with FBI and DEA and all those guys with equipment I built. I got to drive the car, like two years out of school, chasing these guys, and they would hide places, and we could go track them. And it was for bank robbers and counterfeiters and bad people, so...

Q. And did that involve any signal processing?
A. It did. I designed both RF radios. I helped design the antenna arrays that had small pit formal arrays that went on top of the car, and then wrote the software, the signal processing software, that went into the radio, even wrote the display graphics on the display.
The computer we used wasn't even mobile. They didn't have mobile computers. It ran off of a car battery and it was this big and sat on front of me giving off heat all day.
Q. Now, I'd like to talk about some of the other work experience you have. Can you tell us a little bit about your work experience at Spectrian?
A. Spectrian, yes.
Q. Can you please describe that for us, sir?
A. So after Harris, we were young, we wanted to move out to California and have an adventure, so I joined a start-up in Silicon Valley. And Spectrian built high-power amplifiers that go into cellular base stations. They call them HPAs. HPAs are the megaphone that sit at the -- basically at the end of the radios that amplify the signal very high so that it will cover the whole cell.
And these are very power intensive, lots of linearity problems, lots of intermodulation that we've been talking about problems, and we corrected those in those -- in those products.

Q. And did you -- we see here a United States patent. Did you receive any patents for that, some of the work you did there?

A. Yes. I don't remember how many I got there, six or seven, or I don't remember. But this one in particular -- so one of the big trends that was going on at that time was taking analog things, you know, analog like a record player and making them digital, like a CD. And so my job being a digital signal processing guy was to come in and take all their analog controls that didn't work that great under temperature and things and replace them with digital controls.

So the whole world was going digital, and I was brought in to help them change how these worked so that you could have a more reliable product.

Q. And now I'd like to talk about WiDiFy, if I pronounced that correct?

A. Yes.

Q. Can you tell us about your work at WiDieFy?

A. Sure. Sure. After I left Spectrian, I went to another company called Tantivy Communications. We built base stations and subscriber units. And after about five years at that company, some friends of mine and I decided that we had some -- some interesting ideas and we wanted to start a company. So we -- we left our jobs. I literally had three kids in diapers and a mortgage and left my job without a

paycheck and went and started a company.
Q. And what did that company do?
A. We built WiFi range extenders. So it was a WiFi product you plug in the wall at the extent of the coverage of your WiFi network in your home and it would double the range to your home. Those are common now. We did this in 2002.
Q. And did that involve any signal processing and things like we've been talking about in this case?
A. Oh, absolutely it did, yes.
Q. And did you receive any patents for the work that you did at WiDieFi?
A. Yes. So -- so I was issued 18 or 20 issued U.S. patents for improving WiFi coverage and cellular coverage as well by repeating the signal.
Q. And can you tell us a little bit about the improvement of the cellular coverage work that you did?
A. Sure. So we were starting in the home networking space. You can see in these pictures there's a product on the right-hand side that the silver one in the back says Linksys on it. So that was a product that Linksys built with our technology in it.
The gray box on the right-hand side was made for taking a signal from outside and bringing it inside. It was for WiFi, but we had technology for cellular signals also. And so through part of that process, Qualcomm got interested in our

technology because indoor coverage, we all know, when you walk in with a phone, oftentimes you have coverage issues. And so they got interested in the product and they ended up buying our company for the technology.

Q. So Qualcomm acquired a company in about what year was that?

A. That was 2002 they acquired the company.

Q. 2002.

A. No, I'm sorry. 2007.

Q. Okay. 2007. So then once Qualcomm -- well, first, can you tell us who Qualcomm is?

A. Yeah. Qualcomm it's not a big name brand. They build the guts that go inside your cell phones. So there's chips that have radios that are very inexpensive and extremely high performing, and they build those chips that go inside your cell phone. They're the engines in the car, so to speak.

Q. And did you go to work for Qualcomm once the company was acquired?

A. Yeah. As part of our deal to -- to be acquired, I was required to work there for a period of time. And I had so much fun, I ended up staying two years with them.

Q. And what kind of work did you do with Qualcomm?

A. Well, they were interested in our cellular repeater technology. And so they had me and a team build a prototype that would take 3G signals from outside in a single unit and

repeat them to indoors.
Q. And you mentioned 3G there. Can you tell us what 3G is?
A. Sure. Yeah. It's -- do you, remember originally phones only made phone calls? I'm dating myself. And then after that, you could surf the internet. Well, when you transitioned from just voice into doing internet data, that was really in the 3G days. And so it was called WCMA is the -- is the technology.
Q. And that -- was that a cellular standard then?
A. Yes. Yes, it was.
Q. Now, sir, you said you were at Qualcomm for about two years. What did you do after that?
A. So after that, I became a consultant and I built wireless products for a number of different clients. One of the people involved in my company on the board, one of the funders of my company, started a company as well called CDF Networks, and he asked me to consult to that company.
And we built point-to-point wireless radios. In fact, there's one right there on the right-hand side. And we had another one around the corner. You couldn't see it when we were bouncing signal off the Freedom Tower and down the street. And it -- it worked great.
Q. And what was the purpose of that? What were they for?
A. Yeah. So for wireless operators, one of the largest costs is backhaul from the cellular base station. The

internet connection from the cell tower that moves all your packets from the cell tower to the internet is very expensive. So getting from the wireless system out to the rest of the network is very expensive. And so this is a wireless approach for connecting a base station back to their core network, they call it.

Q. So, sir, over the 30-plus years in the wireless industry that you just described, how many wireless and cellular products, components, do you think you've designed over that time?

A. Oh, boy. You know, Harris was lots of small numbers, but tons of product. So probably worked on 10 or 15 products there. Spectrian was fewer number of products, but we shipped, gosh, hundreds of thousands of amplifiers to roll out 3G. And then Qualcomm, of course, they ship in the billions of chips. And so in terms of unique products, I worked on 20, 25, something like that.

MR. NELSON: Your Honor, at this point we would tender Mr. Proctor as an expert in wireless communication systems and digital signal processing.

THE COURT: Is there objection?

MR. GRINSTEIN: No, Your Honor.

THE COURT: Without objection, the Court will recognize this witness as an expert in those designated fields.

Please continue.

MR. NELSON: Thank you, Your Honor.

Q. (BY MR. NELSON) So, sir, can you just give us a high-level summary of the opinions that you're here to offer today?

A. Yes. The Nokia products within AT&T's network, they do not infringe the 135 [sic] nor the '775.

Q. Let me stop you. You said 135. You mean '134?

A. I'm sorry. Yeah, the '134 and the '775, and that both those patents have been done before. They're not valid. The technology has been done before, and I'll explain that.

Q. Now, can you just give us an overview of what you looked at in order to form these opinions?

A. A lot of documents. Obviously the patents themselves as well as something called the file history. The file history is more or less a binder of all the interactions between the Patent Office and the inventor, and it gives you lots of information about what was out there and why they allowed the patents.

Also the Court's claim construction, as we talked about, the Court tells you how to interpret certain terms and that's important to apply.

Q. Now, prior art in the field, can you tell us what that is?

A. Yes. The prior art is -- you are not allowed to have a

patent if your invention has been done before, and so prior art is something that was publicly known, that was published, at the time of the alleged invention.

Q. And then technical documentation and source code, what was that and about how much did you look at there?

A. Sure. I looked at a lot of documentation. Obviously the documents we're all looking at today or the last few days are the technical documentation. And then there's also source code, literally the code that Mr. Davis wrote, and other people. I reviewed that in detail.

Q. And then deposition testimony, what did you review there?

A. Sure. I reviewed the inventor Mr. Smith's deposition testimony. I invented -- invented. I reviewed Mr. Wells or Doctor Wells' deposition testimony, pretty much all of the people who have spoken here today, and I included that within my report.

Q. And then you reference other case materials. What types of things were those?

A. Well, just materials related to the court orders and various other documents that would give you an opinion about the products.

Q. And do you know about how much time you've spent in your review of the case?

A. Boy. I think I've been working on it about a year and a half at this point. It's a pretty significant amount of time.

I don't have a number for you, but it's a lot of time.
Q. Okay. And, sir, just so we're clear here, are you being compensated for the time you've spent on the case?
A. Yes, I am.
Q. Okay. And what's that rate?
A. $500 an hour.
Q. Okay. Thank you, sir.
Now, let's talk a little bit about -- just to orient ourselves. So here in DDX 5 slide 12, can you describe for us the uplink and downlink that's shown here in the diagram?
A. Yes. So I'm sure you guys have heard this so far, but the uplink is the transmission from the handset to the base station, and the downlink is the transmission from the base station back down to the -- the handset.
Q. And is that kind of industry standard terminology?
A. It is. The only other terminology is forward link and reverse link, forward link being the same as -- as the downlink and return link being the uplink. You see that sometimes.
Q. Now, the base station. We've heard some about a base station, but can you just generally describe for us what the parts are of a base station?
A. Sure. So you have the base station processing, which is at the bottom of the tower, and then you usually have fibers running up the tower or cables, and that goes to this remote

radio head. And the remote radio head is really the radio, and then that remote radio head has RF cables that come out, and then they attach to the antennas.

Q. Now, sir, where would the RF signal be in the -- what we have here?

A. The RF signal would go between the antennas and the remote radio head, and then for a short period within the remote radio head, which we'll talk about, but it terminates there.

Q. Okay. Now, let's talk a little bit -- we've heard about passive intermodulation products or passive intermodulation interference. Is that a new thing in the field?

A. It's not. This is a paper from 1990 by an individual named Lui, L-U-I, and he describes the phenomenon. It's been known for, you know, many, many decades, but you can see the paper provides an overview of passive intermodulation interference. It describes the theory, the non-linearity mechanisms, how it occurs, what the problems are that make that occur. And then it even gives the mathematical formulas to calculate it.

In fact, if you see all those lines sticking up, you're probably used to seeing this, but this is a frequency domain depiction. So the lines -- the height of the lines are the intensity, the power of the signal. And then where the lines are on the -- horizontally are the frequency. So more to the

right is generally higher frequency, and more to the left is lower frequency.

Q. And for the record, the Lui reference you are talking about, is that DX 40?

A. It is, yes.

Q. Okay. Now -- so, Mr. Proctor, have you analyzed in detail the Finesse patents?

A. Yes.

Q. Okay. And from what perspective, did you do that analysis?

A. I did it as one of ordinary skill in the art.

Q. Okay. So we've heard that term a few times, but can you explain to us what that is?

A. Sure. It's -- it's a certain level of education and/or experience that that hypothetical person would understand about the industry.

So the level of ordinary skill in the art in my opinion at the time of the invention, at that time a Master's degree in electrical engineering or computer engineering or a similar field, and a few years, two or three years, of work experience related to communication systems design and digital signal processing or signal processing. But if you had more education, that could substitute for some of the -- some of the work experience or vice versa.

Q. Now, do you and Doctor Wells have any material

disagreement about what a person of ordinary skill in the art is in this particular case?
A. No, I don't think so.
Q. Okay. Is it anything that would be relevant to the opinions?
A. No.
Q. Okay. Now, the '134, can you tell us briefly what the '134 teaches?
A. Sure. I've highlighted a portion from the abstract of the patent. And it says, the receiver described samples the entire band, window, in which there can be signals of interest or signals that can generate interference. All the signals are sampled in one bit stream, and the bit stream is processed to isolate signals of interest and interfering signals. The isolated interfering signals are then canceled out of the signal of interest.
Q. And so as a person of probably more than ordinary skill in the art, what -- can you tell us in English --
A. Sure.
Q. -- what that conveys to you?
A. Sure. What we heard earlier, the signal of interest is the signal we're trying to receive. It's the thing we don't have. It's what we want to know. Right? It's the transmission signal from the mobile phone back to the base station. So we're trying to figure that out. That's what

we're interested in.

And this intermodulation distortion, when you're transmitting very -- remember, I worked at a power amplifier company. It boosts -- you know, it's this giant megaphone. And so you can think of distortion like water, the waves, the radio waves, and, you know, water in a lake and it's hitting the bottom of a dock. You have these pretty waves going along, but then it hits a dock and it flattens them and they don't look right anymore and it causes water to splash all around. Well, that's very similar to what happens in -- in any kind of intermodulation distortion, including passive.

So when you transmit signals, we've all heard the -- the rusty bolts or, for external PIM, the reflections off of a rusty fence coming back, can cause that level of distortion which ends up bleeding signals in that Christmas tree sort of diagram that it showed earlier with the Lui reference that get into the band of the signal of the interest, the signal you want to hear. And so it's -- it's like somebody is having a party next door of your hotel room and you're trying to sleep. Right? It's interfering with what you're trying to do so you can't get it done.

And so what it's really about is isolating the signal that has the interference in it, and then isolating the distorting signal, the -- the source signal, and then approximating or -- or generating the -- the intermodulation

distortion, that you know is inside the signal that -- that you want, and then subtracting it out.

That's what it's about. That's what the patent's about.

Q. Now, let's talk about the Nokia radios and the materials you analyzed. So DX 287 here. Can you tell us what that was and how that informed your opinion?

A. Sure. Yeah. So the Galaxy PIM-C functional specification is a general description of -- of how the system operates.

Q. And then DX 281, can you tell us that and how that informed your opinion?

A. Yes. That's talking about GROOT. And we just heard earlier from Mr. Davis that the GROOT is the FPGA design. It's the -- sort of the engine that does the cancellation. And that's just -- this document is defining the architecture.

Q. And then DX 279, can you tell us how that informed your opinion?

A. Yes. That's the Galaxy hardware specification. That's the document that describes the hardware for the whole Galaxy product.

Q. And DX 283, can you --

A. And that's the Galaxy passive intermodulation PIM software architecture describing the interfaces and the function of the software that interfaces to GROOT.

Q. And is that software architecture the one that's actually

for the products that are at issue in this case --
A. Yes.
Q. -- as opposed to the one we just saw?
A. Right.
Q. Okay. Now, the last one, DX 295, which will be a sealed exhibit, can you tell us how that informed your opinion?
A. Yes. So as part of this, it's one thing to look at documents. It's another one to actually look at the source code to see what it's really doing. Right? And so I spent a considerable amount of time going through the source code trying to understand the consistencies and -- and understand that the documents are indeed doing what -- or saying what the product is doing.
Q. Now, the source code, will that tell you how something is actually implemented?
A. Yes.
Q. Okay. And tell us why that is.
A. Sure. It's sort of like your DNA. Your DNA is kind of who you are. Right? And it is the instructions that are specifying how this thing works. It is literally the instructions.
Q. Now, with respect to DX 287, the Galaxy PIM-C functional specification, I mean, can you remind us generally what this is?
A. Yes. We've looked at this a number of times over the

last few days. This is the architecture for the Galaxy PIM-C functional -- well, it's the functional block diagram.

Q. And what did it mean, the functional block diagram. Can you tell us as one of -- you know, an expert here, what would that tell you?

A. Yeah. It is telling you at a top level the parts of the system and how they interact with each other. So they're trying to describe how it functions; not the most minute detail, but generally how it functions.

Q. So now in blue here, can you tell us what is highlighted in blue?

A. So we talked about uplink earlier being from the mobile to the base station. This shows the uplink going from the mobile through the front end and to the baseband processor in the back, which is the Nahka ASIC on the left-hand side of this figure.

Q. And we've heard that term 'baseband processor' a few times. Can you tell us what that baseband, what's that?

A. Yeah. So a radio will have waveforms. It takes waveforms and it outputs something in the baseband processor, and the baseband processor converts it from waveform signals into information that you're trying to receive.

So the internet packet, you know, the website request or the web page, what have you, that is the payload, that's the information you want, and so the baseband will take those

waveforms and convert those waveforms into the information that flows over the internet.

Q. And so when you transmit a signal from the handset here, is that signal carrying some kind of information? Is that the idea?

A. Sure. It's like people on a bus. Right? It's the signal is carrying encoded information in a waveform, and the baseband extracts that information from that coded waveform to turn it back into the information that you originally wanted to send with your phone.

Q. So is that kind of like a decoding then to get your information back?

A. Yes, it's a decoding, yes.

Q. So now let's talk about -- you mentioned downlink. And with respect to the Galaxy PIM-C functional spec, can you explain to us that downlink path, please, sir?

A. Sure. So the baseband -- the base station has to talk back to the handset, so that baseband processor has to take that information, the payload, the packets that you want to see on your phone, and it has to encode it into a waveform.

It does that, and then it sends it through the transmitter, which is the yellow portion that I've highlighted. And then it goes down over the air from the antenna down the downlink to the handset.

Q. Now, the signals that you're transmitting, are those

using the same antenna as the signals that you're receiving?
A. Generally, yes, they can.
Q. Okay. So in the functional diagram here, is that the way things are shown?
A. Yes.
Q. Okay. So then in that case can you -- the transmitting signals that you have cause interference with the signals you're trying to receive?
A. Yes. They can. In fact, I have a box around the front end filter called a duplexer, and its whole job is to separate, transmit, and receive so the transmit goes to the right place and the receive goes to the right place.
Q. And so what are some of the ways that the -- and let's talk about PIM because that's what the case is. So how could there be PIM caused by the transmit signals?
A. So out of that, you can see the PA, that triangle. That's the power amplifier. Again, that's the megaphone. It goes through the duplexer, which is separating or combining signals, depending on which way you're going. And as you pass that, there are distortions that can occur in that device as well as there are other components, the cables, as you've heard about--if you've got a loose connector, the antennas, if you've got a loose -- if you've got a screw loose, I guess, and it will vibrate, they call it frutronic effects.
So when you hit something with a strong signal but

there's mechanical vibration, it actually becomes an acoustic imprint that happens on the signal--microphonics. And so that can actually distort the signal.

And with high -- so PIM typically is not an issue in a handset because handsets are very low power, they transmit little amounts of power. But at high power, like this big megaphone, this very strong signal from the base station, it's hammering on this antenna. Right? It's trying to reach miles and miles. And so, as a result, at these very high levels very small effects can start to resonate in the system and that can cause this passive intermodulation distortion between the transmit signal into the receive band.

Q. Now, sir, so the --

MR. NELSON: If you blow up the box, Mr. Horseman. At the top where it says 'PIM sources', it's in the dotted box by the antenna there. There you go.

THE WITNESS: Yes.

Q. (BY MR. NELSON) So here it says, 'PIM sources, transmitter, duplexer ANT connector/cable interface cable, antenna'. Do you see that?

A. Yes.

Q. And can you tell us what that's referring to?

A. Sure. That's just sort of saying where generally the problems arise. So you have the transmit duplexer which is that -- if you see the circle around the TX, that duplexer is

the thing that sort of combines and separates signals.
Q. And then the ANT connector/cable interface, what's --
A. Right. That's the physical connectors we've been hearing about where the cable is kind of connected to the antenna. It can be loose or corroded.
Q. And then the cable, that would be the coax. Is that right?
A. That's right.
Q. And then the antenna itself?
A. The antenna itself, yes.
Q. Now, are these parts something that somebody like AT&T would specify performance on so that you didn't have PIM issues?
A. Oh, yes. They would be designed to not have PIM from the very beginning.
Q. And so now you talked about the interference that could occur from the transmit signals. Would that always be the case just because you're transmitting?
A. No, no. So we heard earlier when you design a system as an engineer, you design the specifications, and when an installer installs something, they are going to install it to a specification as well. And the requirements were that there was no PIM when you put it in.
It makes sense because you wouldn't want to design a system that has a problem from the -- that's still got the new

car smell. You don't want it to be broken when you got it. Right? So you install it, and it should not have a problem at that time, if they test it.

Q. Now, here DX 281 at page 27, this is from the GROOT architecture specification. Can you tell us what this is, referring to at page 27 that we have blown up?

A. Yes. So the red line is a copy of the transmitter signal. So the signal that's coming from the downlink transmitter down the yellow path, there is a directional coupler, which if you see that little --

Q. Let me stop you there. What's a directional coupler?

A. Yes. So if you see that little squiggly thing going up, that's the symbol for ground at the bottom, and then a resistor, and then the horizontal portion is a directional coupler.

And what that means in RF-speak, in radio frequency components, is that it will accept signals going out, going this way kind of from the right -- from the left to the right the transmit signal, but it will minimize or tend to filter out signals going from the right to the left. It's a directional thing.

And so it will take copies of the transmit signal without taking copies from the receive signal. So it separates them based on the direction the signals are flowing.

Q. And the copies of the transmit signals, would those be

the only signals that's on the line, the red line going down to the RF ADC?

A. Yes. That's all that can be there.

Q. So now I'd like to -- so claim 1, 2, and 3, are those the asserted claims here?

A. Of the '134 Patent, yes.

Q. Yeah. So are there elements of the claims that are common, meaning that they repeat themselves across the claims?

A. Yes. The majority of the claims are in common.

Q. And if we look at the first element, "oversampling at a desired frequency, a passband of received signals to create a bit stream, wherein the received signals include signals of interest and interference generating signals", and I'll stop there. Do you see that?

A. Yes, I do.

Q. Now, does that element repeat in claims 2 and 3?

A. It does.

Q. So if that element is not present in the accused products, what does that mean with respect to claims 1, 2, and 3?

A. They would not infringe.

Q. And would that be true even if the other elements were there?

A. Yes. My understanding is that every element of a claim must be present; not some of them or most of them--all of

them. If even one's missing, then it doesn't infringe.

Q. So now let's -- with respect to that first element that I just read, do you have an opinion as to whether the accused Nokia dual and tri-band radios in this case meet that element of the claims?

A. They do not.

Q. And can you tell us why that is, at a high level, and then we'll get into the details.

A. Sure. So "Oversampling at a desired frequency, a passband of received signals to create a bit stream"--so you have to sample a passband, the entire passband--"wherein the received signals include signals of interest and interference generating signals"--two things.

So when you sample this passband, it has to have those two things in it to create a bit stream. And so you need to have and identify a bit stream that has those two things in it. Otherwise, the products do not infringe. And we've not seen that in the products. I have not found it. Doctor Wells has not shown it.

Q. So now on DDX 5, slide 30, we're back to page 14 of the DX 287, the functional specification. What -- and we'll take the red RF ADC first. Can you tell us what the red RF ADC is?

A. So an ADC is an analog-to-digital converter. So it takes the analog signals and converts them into a digital representation bits that represent the waveform, and the

RF ADC in particular is able to digitize signals that -- while they're still at RF.

Q. Now, what signals are there -- remind us, what signals are on the red line going into the red RF ADC?

A. As I mentioned, the directional coupler, the sort of beginning point of the line, the red line is capturing the transmit signal. And so the depiction on the top shows the transmit signal, and that looks like what is transmitted in a -- when you have two carriers.

Q. So the -- then the RF ADC in terms of its output, what's coming out of that?

A. It would be a digital representation of those two waveforms. So the dotted line there is a filter, and it's just showing you, because it's after the transmit duplexer, the transmit filter is sort of -- this is all that gets through. And so it digitizes that and it outputs it toward the GROOT.

Q. And so if you follow the red line that you have to the drawing to the right, that says downlink TX feedback sampled independently. Do you see that?

A. Yes.

Q. Can you explain to us what you're showing there?

A. Well, I put independently because the only signal that's there, that converter only receives the transmit signal. It doesn't receive the receive signal, the uplink signal. That

comes in on a completely different line.

Q. So now if we look at the blue RF ADC, which is a little bit lower down in the diagram, can you tell us what the input is to that blue RF ADC?

A. Yes. So the receiver, the uplink signal, hits the antenna and it travels toward the duplexer. And the duplexer is a filter. It has -- it will take the transmit signal and make it by itself. Right? As it transmits it, cleans it up, then the receive portion of the duplexer is a filter that takes out the transmit signal, and you get just the stuff in the receive band, just the receive signal and unfortunately sometimes interference.

Q. So then what's the output of that blue RF ADC?

A. It will digitize the waveform that I've depicted on the bottom right-hand side where you see the outline of the filter, the dots. And then you see the waveform, the desired signal, the signal that you're transmitting to the cell tower, that's sort of the light blue. And then you see two purple, I've depicted, intermodulation distortion that's fallen within your desired uplink signal. And so that's what's digitized by the blue converter and output as a digital representation into the GROOT FPGA.

Q. So then are you showing a situation here where there would be PIM present in the system?

A. Yes. In this I've depicted where you have PIM occurring

somewhere after -- somewhere either really in your passive components in your transmitter in the dotted lines at the front by the antenna, and they've created intermodulation distortion and they've fallen in band to your desired uplink signal. And that's what the blue lines are or the purple lines within the blue desired signal are.

Q. So are the outputs of the RF ADC, the red one and the blue one, are those the same bit streams?

A. No, no. They're -- they're completely independent of each other.

Q. And why is that?

A. Well, they're -- they're different content, first of all. They're not the same content. And then, second of all, they're using separate -- physically separate devices to change them from RF into digital. They're just different devices. And so they have nothing to do with each other.

Q. So now if we go back to the patent claim and the language that we're looking at there, oversampling at a desired frequency a passband of received signals to create a bit stream wherein the received signals include signals of interest and interference generating signals, do you see that?

A. Yes.

Q. So now can you tell us why that language is not met with reference to the DDX 5-30, the drawing that you have here?

A. Yes. In order to satisfy that language, as I said a

moment ago, you have to have at least one bit stream that has both the signal of interest and the interference generating signals in it.

You can see here that the bit streams coming out of the red RF ADC only have the transmit signal, and the bit stream coming out of the blue RF ADC only has the signal of interest or the desired receive signal in it.

Q. So why is it in the Galaxy radios that they use two different analog-to-digital converters?

A. Well, as opposed to using one like the patent talks about?

Q. Exactly.

A. So the problem that was being solved in the '134 was to solve any interference. In fact, the patent talks a lot about searching for the interference. It doesn't know what it is. If you don't know what it is, you need to digitize a wide, wide area. So you need -- you can't look through a microscope. You have to keep your eyes wide open. Right?

Well, the fundamental difference there is if you digitize the whole -- everything, everything that could be problematic, then you search through it, and then you say, oh, well, there's a problem over here and a problem over there and you're trying to solve all problems, that's what they were trying to do in the patent. Whereas, Nokia has a very, very specific problem, and so they don't need this significant

horsepower to solve all of the problems. They're just trying to solve one. They know what the problem is. The problem is their own transmitter between the different bands. So when they transmit, they know what they're transmitting.

THE COURT: Just a minute. Yes, counsel.

MR. GRINSTEIN: Your Honor, I'm going to object to this and move to strike. The witness is conducting claim construction on the stand talking about what the patent means. He's not tied it to any claims or any claim term, and the question didn't even call for that. So I wasn't given a chance to object to the question.

THE COURT: What's your response, Mr. Nelson?

MR. NELSON: All he was saying is why the accused product does it the way it does it. That's all.

THE COURT: Well, the Court's made it very clear that there are several important terms or portions of the language from the claims that the Court has interpreted or construed previously. And if they weren't important to the parties, the Court wouldn't have spent the time to research them and construe them and put forward these constructions.

And from the beginning of the trial, I've made it abundantly clear that everybody involved, including the jury, are bound by those constructions and must apply them. There is no option to think they're right or they're wrong or they should be different. They have to be accepted on their face

and applied as they are. And any attempt by a witness to go around those or cast doubt on those is improper.

I'm going to overrule the objection at this point, but I want it understood that the testimony going forward should not go down that path at all.

MR. NELSON: Understood, Your Honor.

THE COURT: All right. Let's proceed.

Q. (BY MR. NELSON) So now --

THE COURT: As a matter of fact, let's not proceed. It's 3:00, and we probably need to take a recess since we've already stopped the train for a minute.

MR. NELSON: All right. Thank you, Your Honor.

THE COURT: Ladies and gentlemen of the jury, if you'll just leave your notebooks in your chairs and take this opportunity to stretch your legs and get a drink of water, we'll be back in a minute to continue. I'm going to try to keep this short.

Follow all my instructions, including not to discuss the case with each other. And, again, we'll be back shortly.

The jury's excused for recess.

(Whereupon, the jury left the courtroom.)

THE COURT: All right. We stand in recess.

(Brief recess.)

THE COURT: Be seated, please.

Mr. Nelson, are you prepared to continue with your

examination of the witness?

MR. NELSON: Yes, I am, Your Honor.

THE COURT: All right. Let's bring in the jury, please.

(Whereupon, the jury entered the courtroom.)

THE COURT: Welcome back, ladies and gentlemen. Please be seated.

Mr. Nelson, you may proceed with direct examination of Mr. Proctor --

MR. NELSON: Thank you, Your Honor.

THE COURT: -- or continue with direct examination, I should say.

MR. NELSON: Thank you.

Q. (BY MR. NELSON) So now let's talk about specifically what language or what element is missing that we've been talking about here from claims 1, 2, and 3 of the '134 Patent.

So remind us what it is the language that we're focused on here requires?

A. Sure. The highlighted pink area here, that is indicating that you have to digitize the passband, oversample passband, having both the signal of interest and the interference generating signal, to have a single -- in a single bit stream.

Q. So now then from your analysis of the Nokia products, what would be a potential signal of interest?

A. Well, that would be a receive signal. It would be -- it

would be the information that the base station wants to receive that it doesn't know. It already knows the transmit signal. It doesn't know the signal that's in your phone. So it's trying to receive that, and that's the signal of interest.

Q. And then in the Nokia system, what are -- what's the only signals that could create potential interference that it's designed to correct?

A. It's the transmit signal. So the transmitter is used to obviously send information to the handset and that gets into the front end of the -- of the device, of the -- of the base station, and it causes PIM. And so the way to model that is to use that exact same signal. Right? If the transmit signal is creating the distortion, then use the transmit signal to model the distortion to remove it out of the thing that you want, the receive signal.

Q. And in the accused Nokia radios, are those two signals, the uplink signal and the transmit signal, part of the same bit stream?

A. They are not.

Q. And why is that the case?

A. Because separate paths. They arrive at the chip using separate paths, and use completely separate analog-to-digital converters so they're never combined. They come in separately on separate lines, and then they're changed into digital form

separately, individually, and so they never are combined into a single bit stream.

Q. And why is it done that way in the Nokia radios?

A. Well, the Nokia radios have a very specific problem. They're not trying to solve the world of interference overall. They're trying to solve just internal PIM, and -- which is caused by its own transmitted signals.

So it knows what it's transmitting so it doesn't have be super flexible. It just has to digitize the transmit signal. So it takes a single converter and aims it at the transmit signal because it knows where it is, it doesn't have to search for it.

Q. So now I want to focus on the -- in element B there where it says, "Isolating signals of interest in the bit stream using one or more decimating filters." Do you see that?

A. Yes.

Q. And does that language repeat in claims 2 and 3?

A. It does. It's effectively the same language.

Q. So, now, is there any isolation of a signal of interest in the bit stream using one or more decimating filters in the Nokia product?

A. So the signals are already separate from each other, so you don't have to isolate them from each other, they are already isolated, and they're not coming from the same bit stream. So you're not isolating the signals -- for instance,

the signal of interest in the bit stream, the one bit stream that has both of them in it, you're not separating the two signals.

And so the source signal is not separated from the bit stream and the -- and the signal of interest is not separated from the bit stream by this isolation process. They are already separated.

Q. So then what does that mean with respect to the language in claims 1, 2, and 3 that requires isolating signals of interest in the bit stream using one or more decimating filters?

A. That's not shown to be present in the product, so it would not infringe for those reasons also.

Q. Now, isolating source signals that generate one or more intermodulation products in-band of the signal of interest using one or more decimating filters, do you see that?

A. Yes.

Q. Now, would -- and does that language repeat in claim 2?

A. It does.

Q. Now, with respect to claim 3, can you tell us what's a little bit different in claim 3?

A. Well, let's see. It kind of says it in one line, "one or more filters to isolate signals of interest and interfering signals in the bit stream." So it, again, is referring to the bit stream, the bit stream that has both of them in it. So

the products don't use one or more filters to separate it from the same bit stream. So that wouldn't be satisfied, either.

Q. So with respect to the element requiring isolating source signals, would that be present in the accused Nokia products?

A. No.

Q. So, now, were you here for Doctor Wells' testimony?

A. Yes, I was.

Q. So what do you understand that Doctor Wells says are the claimed signals of interest? In other words, does he map the signal you're trying to receive and say that's the signal of interest?

A. No, no. He does not.

MR. NELSON: And, Your Honor, may I pull this up?

THE COURT: You may.

MR. NELSON: Thank you, Your Honor.

Q. (BY MR. NELSON) So what does Doctor Wells say is the signal of interest in the claim?

A. He says it's the transmitter signal. I think he said the transmit reference signal specifically.

Q. And what is the transmit reference signal? Remind us.

A. It's the transmitter signal that's sent down to the mobiles. It's the information you already know.

Q. So is the baseband processor in the base station trying to receive the signals that it's transmitting?

A. No.

Q. And why not?
A. It already knows them. It's not receiving them.
Q. Okay. So the -- with respect to the interference generating signals, what do you understand that Doctor Wells mapped to the interference generating signals in the claim?
A. Yeah. He pointed to a label for the red line. He pointed to that red dashed line and he said that there's a label that says DL(TX) reference and modeled PIM path. And so he said that the path from the transmitter to the analog-to-digital converter is the source signal or the interference generating signal.
Q. Right. And that's referred later in the claim as the source signal. Is that right?
A. Yes.
Q. So the -- first of all, on the red line coming down into the RF ADC, is there a modeled PIM path signal?
A. No.
Q. And why do you say that?
A. Well, where would it come from? It can't be there because the signal is modeled -- the interference is modeled in that box in GROOT where it says PIM adaptive model, it's using the transmit signal to generate the interference, a model of the interference. But -- so how could it be before you even generate it?
Q. So the -- you were referring to the PIM adaptive model

block. Is that right?
A. Yes.
Q. And what's the signal that goes into the PIM adaptive model block?
A. It's the transmit reference signal. It's the signal that was transmitted down, converted, digitized along the red path or along the path to the model and then into the GROOT.
Q. So, now, if we look at the Court's construction of signal of interest, it says, "With respect to the receiver, a signal that the receiver is trying to receive and send, in digital form, to the baseband processor." Do you see that?
A. Yes, I do.
Q. Does the transmit reference signal meet the Court's construction?
A. No, it does not.
Q. Okay. But is the transmit reference signal what Doctor Wells identified as this signal of interest in the accused products?
A. Yes.
Q. Okay. Can you tell us why that does not meet the Court's construction?
A. Yes. So with respect to the receiver, the receiver is not trying to receive the transmit signal, it's trying to transmit the transmit signal, and then it's not trying to send and it doesn't send the transmit signal back to the Nahka

ASIC, which is the baseband processor. And so that's why it doesn't meet that limitation, because it's the transmit signal. It's not trying to receive it and it's not sending it back to the baseband processor, which is where that information came from.

Q. And does it make any sense to call the transmit reference signal a signal of interest?

A. No, because the signal of interest is the signal you don't know that the base station is trying to get from the transmitter of your phone. It's trying to receive that information, receive it at the base station so that you can have a two-way conversation from your phone.

Q. So is the base station trying to send information to itself?

A. No.

Q. So now with -- this is back to DDX 5.34. Can you tell us where the baseband processor is here?

A. Yes. The baseband processor is the Nahka ASIC on the left-hand side, if I were -- I think I can draw on this. That's the baseband processor.

Q. And the GROOT FPGA, is that a baseband processor?

A. No, it is not. It receives -- it processes information not at baseband.

Q. And is the GROOT FPGA trying to -- I think earlier you used the term 'decode' the information from that signal?

A. No, it's not. All it's doing is trying to remove the interference. That's its job--remove the interference that's in the signal that you want. That's all it does.
Q. And what's the job of the baseband processor?
A. To then take that cleaned up signal that doesn't have the jammer in it and turn it from a waveform into the information that you're trying to send to the internet.
Q. So do the downlink transmit signals or the downlink transmit reference signals, are those ever provided to the Nahka ASIC?
A. No, they're not.
Q. And can you show us in DX 287.14 why that's the case?
A. Yes. So right here you see this green line that says desired uplink, desired UL, uplink. That's the uplink signal transmitted from the user's phone, processed by one converter by itself, down through the uplink signal actual PIM right here, actual PIM, and uplink signal. Then it gets the interference removed, and it proceeds to the baseband processor where it's turned from a waveform into the information that -- that you're trying to send.
Q. Now, let's look at some additional things in claims 2 and 3.
So here we have a means for oversampling and a sampling unit to sample. Do you see that?
A. Yes.

Q. And in claims 2 and 3, what are these two structures doing? What are they used for?
A. So these are doing the oversampling or the sampling depending on the claim.
Q. And so has the Court provided a construction of those terms?
A. Yes.
Q. And we see here on the bottom the Court's constructions. Is that right?
A. That's correct.
Q. So what is the -- we've talked about the function already, but what's the structure that's required by the Court's construction?
A. The structure is one or more Sigma Delta modulators or flash A/D converters.
Q. And do the accused products have one or more Sigma Delta moderators or flash A/D converters to do oversampling?
A. No, they don't.
Q. And can you explain to us why you reached that conclusion?
A. Yes. As part of my research, I looked through the documentation and it showed the model number of the Texas Instruments A/D converters that they're using. And I downloaded the data sheet for those converters, and read through them to figure out what the architecture is. And it

turns out it's not a Sigma Delta modulator and it's not a flash A/D converter. It's using a different architecture, which there's a number of.

Q. So here it says, the signal to noise ratio of the ADC is limited by three different factors the quantization noise is typically not noticeable in pipeline converters and is 84 dB for a 14 bit ADC. Do you see that?

A. Yes, I do.

Q. So pipeline converters, can you tell what that refers to?

A. Yes. When -- when one is trying to get certain properties of the converter, you'll choose different architectures, the right tool for the right job. A pipeline converter is good at very high speed with very specific precision, but there's a trade-off.

Q. And what's that trade-off?

A. The trade-off is there's delay and -- and some other complications, but the delay can be substantial. So a pipeline converter breaks the problem into chunks. They'll do a first chunk and then it will kind of delay a little while and then do another chunk. So it's using additional hardware, copies of the same hardware, and -- and breaking it into chunks.

So there's power consumption issues, and there's -- there's also delay issues. But you get the benefit of this specific type of conversion--more speed.

Q. Now, is there a -- would one of ordinary skill in the art think of a pipeline converter such as the Texas Instruments part we see here is the structural equivalent of an ADC -- or a flash ADC converter or a Sigma Delta modulator?
A. No, you would not.
Q. And why is that?
A. So a Sigma Delta has a feedback loop inside of it so it converts and so it gets very high precision conversions at a specific speed. But it's a low bandwidth type converter compared to a flash converter is extremely high, it takes a lot of power, but the problem is you -- it has the benefit of no delay, but it has the trade-off of a lot of power and less resolution very often.
Q. Now, so then with respect to the first three elements of claim 1 and 2, what are your opinions?
A. They're not infringed.
Q. And when you say not infringed, do you mean --
A. The product doesn't meet the limitations of those claims.
Q. And then with respect to claim 3, the first two elements, what's your opinion there?
A. That the products are not infringing those limitations.
Q. So I want to talk -- go to element [f]. Do you see the very last element there?
A. Yes.
MR. NELSON: If we could blow that up a little bit.

Q. (BY MR. NELSON) The functional performing phase and amplitude adjustment on estimates on the intermodulation product interfering signals in a closed loop manner. Let's just stop there.

A. Okay.

Q. So do you think that language, doing that in a closed loop manner is found in the accused Nokia radios?

A. No, it's not.

MR. NELSON: So if we can go forward.

Q. (BY MR. NELSON) So let's explore that. Now, the box on the right, can you tell us what the box on the right is from DX 281 at page 42?

A. Yes. That's the PIM engine.

Q. And would that be part of the GROOT FPGA block?

A. Well, it shows a bit more than that. It shows antennas and the duplexing filters, but it's basically a block diagram of the operation, including the GROOT.

Q. So where is the model that's used to cancel the PIM generated in this block diagram?

A. Yes. The model is the NL block right here. There's four of them because there's four antennas.

Q. And where is the cancellation then performed?

A. The cancellation is in the post NL block, which is this green block here. And, again, because this has four antennas, four receivers, it's got four of those cancellation blocks.

Q. So now if we look at DX 281 at 66, is this showing the internals of one of those NL blocks that you just talked about?
A. It is.
Q. Okay. And can you tell us how this informed your opinion regarding whether the accused products are closed loop versus open loop?
A. Well, so let me clarify. This is the post NL block, not the NL block.
Q. Thank you, sir.
A. So I'm sorry. What was the question again?
Q. Yeah. Can you tell us how this, which is DX 281 at 66, the internals of the post NL block informed your opinion about whether the accused Nokia radios met -- meet the closed loop limitation?
A. So here you can see the NL model out, and you can see the receive signal in, and then the subtraction. And that's where the estimated distortion here is subtracted from the signal you want here, and then it flows out, corrected receive out. It's corrected. So the distortion from the PIM has been removed from -- from this.
Now, to have closed loop, to answer your question, you would have to monitor the output of this position here. Closed loop is taking the output and saying is it performing the way I want it to, and then making adjustments to the

actual output that you're trying to accomplish.

Q. And how would you typically do that in a closed loop system?

A. Well, you would feed back, you would compare the output to your -- your ideal performance, and you would feed back control to adjust gain and phase in order to make it cancel correctly. It's -- it's like having -- if you're trying to cancel one -- maybe your interference looks like that and your estimate is 180 degrees out of phase, so it will cancel.

But if your estimate is like this and your error is lined up with it, it will make it twice as bad, it will add to it, it will actually get bigger, or if it's just off in this direction, it won't cancel it.

So you have to cancel it so it's the exact opposite. It's the same signal -- like we heard about noise canceling headphones, it's got to cancel it instead of make the noise twice as loud. And this would make it twice as loud, where this would cancel it out. So that's phase adjustment. It's sort of rotating it to line it up.

Q. So with respect to the accused Nokia radios, do they perform any phase adjustment in a closed loop fashion?

A. No, they don't.

Q. Now, so here if we look at page 56 from DX 281, can you tell us how this informed your opinion about whether the accused Nokia radios perform any phase adjustment in a closed

loop fashion?

A. Yes. So the phase adjustment that was accused is a delay block.

Q. And where is that shown in this?

A. It is this guy right here.

Q. Okay.

A. That's the accused delay block.

Q. And is -- does that indicate that phase adjustment is done in a closed loop fashion?

A. No, it doesn't, and there's two issues with it.

Q. And can we have the first one?

A. Yeah. The -- the first is that it's actually -- the accused is actually on the receive side. So what Doctor Wells has pointed to for being the phase shifter is actually on the receive signal side, not on -- not on the estimate side. The orange is from the NL block, and that's the estimate side.

And then the second is, as we heard Mr. Davis say, the -- this particular delay is not adjusted. When the powers on, it's a calibration -- from my reading, it's a calibration that is set for the type of antennas and how long your cables are, it's set once. And then there's other calibrations that happen on the other path, but this is only set once while the thing's operating.

Q. So, now, with respect to claim 1, can you tell us in summary what elements are missing from claim 1?

A. Yes. The oversampling for a single passband is missing. The two isolating steps are missing. The performing the phase and amplitude adjustment using a closed loop is missing. There's also no sub sample phase shift being performed.
Q. And then would it be the same with respect to claim 2?
A. Yes, it would.
Q. And then we talked about the structure, the pipeline converter versus the Sigma delta. How would that fit into claim 2?
A. Claim 2 would further not meet the Court's claim construction for the isolating signals of interest structure or the means for isolating source signals structure.
Q. Okay. Now, with respect to claim 3, would those same elements be missing from claim 3?
A. Yes, they would.
Q. So now '775 Patent. Can you just tell us at a high level what the '775 Patent is about?
A. It's another PIM removal patent that has some different aspects to it. In particular, I've highlighted some portions that summarize it: Digitally generating the IMP cancellation signals using a process based on a power series, which is a mathematical equation description of a non-linear process generating the IMPs, generating third order IMP cancellation signals by digitally multiplying two or three signals of the transmitter signal set to create third order IMP cancellation

signals. And then it goes on to say, other orders higher than third order. All that means is that do you have three signals multiplied for a third order or do you have five for a fifth order.

Q. So now let's look at claim 1. And what do we have highlighted here in claim 1?

A. Well, that is language that was added to the claim to get it allowed.

Q. And what do you mean by that?

A. Well, during patent prosecution, sometimes the examiners will look at what you've submitted and will find documents, patents, prior art that say this has been done before. And it will go back and forth, and you'll get a letter. It's called an office action. And in that office action, they'll say, oh, we found this.

And then you as the inventor with your patent attorneys look at it and say, oh, well, either, no, that's not right, and will argue; or that is right, I will amend the claims and I will add something that will make it different from the thing that you said has already been done.

Q. Okay. Now, I want to focus on the language here at the end. Given three signals, s1, s2, and s3, digitally multiplying and filtering and then there is the seven equations there where n is an integer. Do you see that?

A. Yes, I do.

Q. Is this limitation met by the accused products?
A. No.
Q. And does -- is this limitation found in all the asserted claims of the '775 Patent?
A. It is, yes.
Q. So then if the jury were to find -- agree with you and find that this limitation is not met by the accused product that we're looking at in claim 1, what would that mean with respect to all the accused -- or the asserted claims of the '775 Patent in this case?
A. It would mean for infringement, you don't need to look at anything else, none of them would infringe.
Q. So the Court's offered a construction of three signals, s1, s2, and s3. Right?
A. Yes.
Q. And remind us what that construction is, please?
A. The Court's construction for three signals, s1 s2, and s3, is "signals which must be separately identifiable, but are not limited to three unique input signals."
Q. So does the -- do the accused products meet this construction?
A. No, they don't.
Q. So now do you recall that Doctor Wells referred to this -- it's DX 281 at page 76 -- in reference to the three signals limitation?

A. I do.

Q. Okay. And are there three signals that are used -- three separately identifiable signals that are used in the accused products to do the PIM calculation?

A. No. I only count two.

Q. Now, there's the multiplications, s1 times s1 times s2, going all the way down to s2 times s3 times s3. Do you see that?

A. Yes.

Q. Now, did -- you were here for Doctor Wells' testimony. Correct?

A. I was, yes.

Q. Now, did Doctor Wells ever even attempt to map these equations to what's actually going on in the accused products?

A. He took the claim and he substituted in s1 and s2 and s2 into the claim and then derived some other math and he stopped there. He didn't show or attempt to show where that went into the product. He stopped with a table that showed s1, s2, s3, and then he did a little variable substitution and showed another column with some other formulas, but he didn't connect those formulas that he made with the product. He didn't show it in the product, and there's a good reason for that.

Q. So for purposes of infringement, do you have to compare the claims or in an infringement analysis compare the claims to what's going on in the actual product?

A. You do.
Q. Okay. So in this case who has the burden of showing that the accused products do the same math that's required in the element -- this element of the claim that we're talking about?
A. It would be Finesse has the burden of proof to -- to do that.
Q. Okay. And you said that there was a good reason that Doctor Wells didn't actually do the mapping of what's going on in the accused products to the -- to the claim.
A. Yes.
Q. What is that?
A. Well, he can't because there are two ways to represent a digital signal. You can do it with one set of samples and it's called real mathematics, or you can do it with two numbers called complex mathematics. Complex math requires different equations to do this than real math.
Real math has -- excuse the names. They're -- it's a mathematical thing, but real math is what has been patented here. Complex math is what has evolved over time to be more efficient in electronics. People don't really do it this way now. Over the time over my career, things have moved from using real math to complex math. The equations, these equations, would not work.
Q. And so, for example, if we were to try to find s1 times s1 times s3 in the accused products, could we find it?

A. No, you could not find it.
Q. And did Doctor Wells, other than the theoretical mapping that you talked about, during his testimony did he ever try to map anything that was actually going on in the accused products to the claimed equations that we see here?
A. No, he didn't.
Q. And what does that mean with respect to infringement?
A. That means it does not infringe.
Q. The -- so then the asserted claims here are 4, 9, 16, 21, 29, and 36. Is that right?
A. Yes.
Q. Okay. And so claims 4, 16, 21, and 36 are what?
A. Those are independent claims.
Q. Okay.
A. And they have the limitation --
Q. Okay.
A. -- that you were talking about.
Q. I'm sorry. That's my fault, and I apologize.
So an independent claim means what?
A. An independent claim means it stands by itself. It's -- all the limitations of that claim have to be met to infringe, and it doesn't depend on another claim for additional things that have to be met.
Q. And so with respect to the element we just looked at, the given three signals, s1, s2, s3, digitally multiplying and

filtering with the equation, is that element found in all the independent claims?

A. It is, yes.

Q. Now, claim 9 depends from claim 4. Is that right?

A. Yes.

Q. And what does that mean?

A. Well, a dependent claim, you have to meet the limitations that are described in that claim, but you also have to meet the limitations it's pointing to, that it's depending from. So, for instance, claim 9 is a method of claim 4, so you'd have to meet claim 4. If you don't meet claim 4, you don't meet claim 9.

Q. And then would the same be true for claims 23 and 29 with respect to claim 21?

A. Yes.

Q. Okay. And can you explain that to us?

A. Sure. So claim 21 has that same limitation of -- of the specific math, the type of math, and so that's not met. And so claim 23 depends on claim 21, and claim 29 depends on claim 23, so it goes here. And so if 21 is not met, 23 is not met, and 29 is not met. It just cascades right through.

Q. So then, in summary, what's your opinion with respect to infringement of any of the asserted claims of the '775 Patent by the three accused Nokia radios in this case?

A. They do not infringe.

MR. NELSON: Could we put up PX 3, which is the '134 Patent, and go to the last page?

Q. (BY MR. NELSON) So here's the last page of the '134 Patent, and I believe the jury has that in their notebooks as well. So the 52 there, does that mean there are 52 claims --

A. Yes.

Q. -- in the '134 patent?

A. It does, yes.

Q. So then in terms of your invalidity opinions, you talked about that earlier, which claims are you offering invalidity opinions about with respect to the '134 Patent here today?

A. Just the claims that are asserted in this case, claims 1, 2, and 3.

Q. Okay. So then if the jury were to agree with you, would there still be 49 claims left?

A. Yes.

Q. Now, the --

MR. NELSON: Can I go back to the slide presentation? It would be slide 56.

Q. (BY MR. NELSON) So can you summarize for us what opinion you're going to offer with respect to claims 1, 2, and 3 on the '134 Patent here?

A. So I'm going to offer the opinion or my opinion is that there are a couple of pieces of prior art that make this obvious to have done, and I'll go through that.

Q. So I see there's a patent there to Kim, 6,393,011, and there is another patent, the Bazarjani, that's 6,005,506. Is that right?
A. Yes.
Q. So with respect to the first one, the Kim patent, that's DX 10, Defendant's Exhibit 10, can you tell us what date that was filed?
A. Yes. It was filed December 29th, 1998.
Q. So is there any dispute that the Kim patent, DX 10, is prior art to the '134 Patent?
A. No, there's no dispute over it. It is prior art.
Q. And does Finesse agree with you on that point?
A. Yes.
Q. Okay. Now, the Kim reference, this patent here, 6,393,011, do you know whether the examiner had a copy of this when the examiner was considering whether to issue the '134 Patent?
A. Well, when a patent issues, all of the prior art that the examiner considered is listed right on the patent. It's not on the front page; it's a few pages in. And I looked through that, and it is not. It was not considered. The examiner didn't see this.
Q. So can you -- at a high level, can you just tell us what the Kim patent teaches?
A. It's an interference intermodulation PIM cancellation

patent. It's got a receiver circuit in a mobile communication terminal, and its goal is to prevent the deterioration of the sensitivity when you -- caused by intermodulation.

So when you have a signal of interest that you want to receive and you have an intermodulation coming into your own receiver and it's desensitizing you because it's like having tinnitus or something where you can't hear as well because the noise is there so it's desensitizing your hearing. And so it's -- it's the same goal. And then it does it by a similar approach.

Q. And when you say the same goal, do you say -- do you mean the same goal as the '134 patent?

A. Yes, that's right.

Q. So you have figure 2 blown up here. Can you explain what we're looking at here in figure 2?

A. Yes. So on the left-hand side, you'll see CDMA receive signal right here. CDMA is just a type of -- that's a 3G signal. And so within that, within that signal, you'll see these intermodulation product signals that are sitting right inside of it right here. And so that's the bad stuff, the -- the jammer signals that are preventing you from receiving the way you would like to.

And right here you have the interfering signals. And so we've seen a number of times today what intermodulation distortion is. You have two signals, you have a

non-linearity, and it creates a Christmas tree around it, the side new frequencies that are produced, and the ripples from hitting the dock, and so based on that, these two signals going through the non-linearity produce these intermodulations right where you don't want them. And so this patent is about how to remove those.

Q. And is that the same goal as the '134 Patent?

A. It is, yes.

Q. Now, here we have DX 9, the Bazarjani patent, which is 6,005,506. Do you see that?

A. Yes, I do.

Q. Now, what date was this issued -- or, excuse me, filed, I should say?

A. Yes. This was 1997.

Q. Now, is there any dispute that this Bazarjani patent is, in fact, prior art to the '134 Patent?

A. No, not to my knowledge.

Q. So is that something that to your understanding that Finesse agrees with?

A. Yes.

Q. Now, same question. With respect to the Bazarjani reference, this 6,005,506, did the patent examiner have this reference when the patent examiner was considering whether to issue the claims of the '134 Patent?

A. No, he did not have it.

Q. All right. So can you tell us at a high level what the Bazarjani patent teaches?
A. Well, it teaches using an A/D converter and a decimating filter to isolate signals.
Q. So the assignee here, meaning the party that it's assigned to, is Qualcomm. Is that right?
A. That's right.
Q. Is that the same company that we talked about earlier in your testimony?
A. Yeah. I had worked for them at one point.
Q. So are you familiar with a concept of a motivation to combine?
A. I am.
Q. Okay. Can you explain to us your understanding of what that is?
A. Yeah. So motivation to combine is how likely would it be, what are the motivations that somebody would take these two things, so a person of ordinary skill in the art at the time of the '134 Patent, would they -- if they knew about these two pieces of information, would they put it together, like a bottle and a bottle top or something where it would be obvious that they should go together.
Q. And with your analysis, do you think that there was a motivation to combine back in 1999--let's take that time frame--of the Kim reference and the Bazarjani reference?

A. Yes, I do, for a few reasons. Well, so the Bazarjani reference talks about doing this digitally, where the Kim reference just talks about doing it. It doesn't really talk about digitally or analog very much.

And -- but if you think about 1998 to 2000 time frame, you know, I took a job in California to change analog into digital at an amplifier company. CDs were coming out because -- or were out because record players were going away and digital music was there. The whole world was going digital because it's cheaper, it's more predictable, it's more manufacturable, everybody was going digital.

So doing something that was analog and saying, by the way, do it digital, that's not a big leap. That's pretty obvious thing to do because it's been done in pretty much every industry at that time.

And -- and so that's one motivation.

Q. So how about the field? Are these both about radio receivers?

A. They're both about wireless or at least about electronics for -- for radio receivers.

Q. So you were talking about the digital -- the shift --

A. The evolution.

Q. The evolution. Thank you. Would one of ordinary skill back in this time frame look at the Kim reference and think that there would be advantages to doing things digitally?

A. They would. They would because it would be more predictable, it would be cheaper.
Q. And does the Bazarjani reference show how to do that?
A. It does.
Q. Now, anything else that you think would motivate one of ordinary skill in the art back in that time frame to combine the teachings of these two references?
A. Well, I think the big one is just simply that everything was going digital, that one would naturally be motivated with a pure analog circuit to combine a digital implementation.
Q. So now go back to the claims. And with respect to the similar functions that we've talked about before where those things repeat in the claims, how have you organized the analysis here today?
A. In the same way. Rather than going through everything with one claim and then going through everything with the next claim, and it would just take too long, I thought it would be more organized to just talk about the first limitation for -- for all of the independent claims and then go to the next.
Q. So let's look at that first limitation, the oversampling at a desired frequency, a passband of received signals and -- and continuing on.
Can you show us where that's disclosed in the combination of Kim and Bazarjani?
A. Yes. So in -- in Kim--you can see this is an excerpt

from Kim--the first spectrum includes the CDMA signal and the interference signal. So that's the -- and it's being brought into the cancellation system. So that would be -- that is being sampled if it were implemented digitally.
Q. And the figure at the top right of the page, can you explain to us what this is showing?
A. Yes. This is the signal over the air without the intermodulation PIM. So you see the -- before it's distorted. So you see here this part is the CDMA signal, and then here this would be the interference generating signals prior to it generating the interference.
Q. Now, in the next block, 402, can you tell us what's being shown there?
A. Yes. Here on the top half you have -- after the non-linearity happens, you have the intermodulation distortion. And so now it's the combined signal with the little Christmas tree right in the center of the CDMA desired signal, the signal you want, the signal of interest. So you've seen the distortion happen from the interference generating signals into the signal of interest.
Q. And then in block 406, can you explain to us what we're seeing there?
A. Yes. Well, you're seeing the result of the modeling of the intermodulation from the interference generating signal. So I'll show you more detail in a moment, but these signals

are isolated and they're used to generate these intermodulations, but the middle part is missing here, so -- it got a little messy here. And so these are upside down, they're opposite, and so then they combine and then you null them out. So here they're missing. Right? Here's the interference and here there's no interference. So that is the process. Now you have your signal of interest that's cleaned up that -- that will be utilized.

Q. And so now what does the Bazarjani reference teach that informed your opinion regarding this first element?

A. Well, so Kim is teaching -- it's not very specific about the implementation. It gives an example of an RF implementation and it's got a processor also. And Bazarjani is teaching you how to use a Sigma Delta converter and a decimating filter, I'll read this in a second, basically the present invention utilizes a superior performance of a high speed Sigma Delta analog-to-digital converter to perform the required analog-to-digital conversion, and it does it using a decimating filter.

Q. So then when you did your analysis, did you apply the Court's claim constructions?

A. I did.

Q. Okay. So now with respect to the structure, the additional structure we've talked about before in this first element, the means for sampling and a sampling unit to sample,

applying the Court's construction, did you find that in the combination of Kim and Bazarjani?

A. Yes. We've already talked about the function and -- with respect to the first claim. And if you're oversampling, then you're sampling.

And then the structure is one or more Sigma Delta modulators or flash A/D converters, and we see here the Greek letter Sigma, it says Sigma Delta, Sigma Delta converter, and it's in a few places. And it's talking about oversampling here, and so it's -- it's disclosing that structure.

Q. Now, on these last few slides, just to be clear, and here on the one we're looking at now, what's being shown on the right, the excerpts that you're showing?

A. Oh, this is from the Bazarjani patent.

Q. So then same in the previous slides we looked at, the excerpts, where do those come from?

A. They come from the Bazarjani patent.

Q. And with respect to this first one, where are those excerpts from?

A. Those are from the Kim patent.

Q. And then on the left, what are we looking at?

A. The -- the claims.

Q. Okay. So now let's -- so that's the first element. Let's move on to the next two elements. We'll take these together. And then in claim 3, it is already together as we

walk through this. Is that okay?

A. Yes.

Q. Okay. So here on the left we have the claim language we're analyzing, and what do we have on the right?

A. On the right, these are the isolating signal of interest terms. And so on the right is an image from one of the figures from Kim and some -- an excerpt from the description of Kim, and you see a -- the red here, coupled path for isolated interference generating signals. That's the red from the first coupler. And the main path in blue, main path for isolated signals of interest.

So you have the receiver front end, you have the first coupler that is sending the signal of interest, plus the distortion, the intermodulation, on the blue line through the delay line, and then you have a second path which is propagating the interference generating signal into this thing called an intermodulation product generator. So it's going to generate a model of -- of the interference that is inside the signal of interest.

Q. And now how is it that one of ordinary skill in the art would modify Kim, this figure and what you just described with Kim, using the teaching of Bazarjani?

A. Right. So, again, they don't talk about the analog versus digital implementation --

Q. When you say they, you mean the reference?

A. Sorry. Kim. Kim doesn't discuss the digital analog implementation. He leaves it to a skilled engineer, a person of ordinary skill in the art, to say, how would I build this. It would be obvious to take an analog-to-digital converter, the Sigma Delta converter of Bazarjani, and convert the -- after the front end receiver and then to isolate using the decimation filters, each of those two signals.

Q. So now, again, we have the structure in claims 2 and 3 for this element. We have the means for isolating and--excuse me--in 2[b] and 2[c], the means for isolating. Did the Court offer constructions of those?

A. Yes.

Q. And what is -- we talked about the function, but what's the structure?

A. Yes. The structure is one or more decimating filters.

Q. And does the combination of Kim and Bazarjani teach that structure to one of ordinary skill in the art?

A. It does.

Q. And why is that?

A. Because Bazarjani discusses the decimating filters to perform the filtering step.

Q. And so at what language are you referring to, and we have an example here from column 11, lines 16 to 30.

A. So the improved dynamic range offered by the Sigma Delta ADC also results from high oversampling of the input signal

and then subsequent filtering and decimation, and there's the decimation, of the samples from the Sigma Delta ADC remove out of band noise while preserving the desired signal, thereby improving dynamic range.

And so it's decimating, it's converting, and then decimating for whichever signal you're trying to isolate.

Q. So what's your opinion then with respect to the isolating elements in claims 1, 2, and 3 that we just discussed?

A. That it would have been obvious in light of those two references.

Q. The combination of Kim and Bazarjani?

A. Yes.

Q. Now, I'd like to move to the fourth element of claims 1 and 2. "It's computing an estimate of each of the one or more intermodulation products from the source signals that generate the one or more intermodulation products." Do you see that?

A. Yes.

Q. So can you tell us how it is that the Kim and Bazarjani references disclose that element?

A. Yes. So the previous figure we saw had those two carrier signals, the source signals, the interference generating signals, that came in here to the intermodulation product generator box 306.

And then I've extracted the text that describes what box 306 is from the Kim specification. And it says, IMD product

306 generator generates IMD--intermodulation distortion--products due to beating or mixing of the interference signal tones with one another. So it's -- it is -- he's describing modeling and estimating the -- the intermodulation distortion.

Q. So now we have, again, here in -- with the fourth element of claim 2, there is a means for computing structure. We've talked about the function, but what's the structure from the Court's construction?

A. The structure is a -- sorry. Means for computing. I'm sorry. You were asking about the --

Q. The structure.

A. Oh, I got it. Sorry. A processor programmed to multiply the source signals in the time domain.

Q. And looking at the excerpts on the right, can you tell us how that structure is disclosed in the Kim and Bazarjani combination?

A. The suitable configurations for IMD product generator are known to those skilled in the art. So it's saying everyone knows this who is a person of ordinary skill in the art and you should bring your experience in the ways that it should be done to -- to this box that is defined as generating the intermodulation products.

Q. So then what structure would one -- excuse me, one of ordinary skill in the art use for that?

A. One would -- one would -- if you were implementing this digitally using Bazarjani, you would implement it in a processor to multiply the signals together using a formula that -- that is well-known, and that would generate it.
Q. So now with respect to the first four elements of claims 1 and 2 and these first two elements of claim 3, what's your opinion so far?
A. That the limitations are met, and it would have been obvious under Bazarjani and Kim that that limitation is met.
Q. So now I want to move to the next element [e]. It's canceling out one or more of the in-band intermodulation products using the estimate of the intermodulation products, and then we have a similar element in claim 3. Do you see that?
A. Yes.
Q. So can you tell us how this is disclosed, the canceling out of one or more in-band modulation products is disclosed in the combination of Kim and Bazarjani?
A. So you can see in the figure that I've extracted, there's a plus sign there, and that plus sign is where it's taking the estimate on the bottom right here, and subtracting it. It's upside down meaning it's at 180 degrees. And when you add it to the signal on the top, it nulls out the interference that were right in here.
And so it's meeting that limitation because it's using

that estimate to cancel out the intermodulation product distortion. The text on the bottom confirms that. It says, As a result, it is vectorially added to the delayed output to cancel out the intermodulation products.

Q. Now, with respect to the means for canceling and the cancellation unit, those structures in claims 2 and 3, we talked about the functions, but did the Court construe a particular structure to be required?

A. Yes. The structure is an adder.

Q. And what is it about the Kim and Bazarjani combination that discloses that structure?

A. Well, you can see on the right-hand side in the red circle, that's an adder. It's adding it together, and so that structure is disclosed.

Q. So now let's go to the last element of each of claims 1, 2, and 3, the performing phase and amplitude adjustment on estimations of intermodulation product interfering signals in a closed loop manner. Okay?

A. Yes.

Q. So how is it that your opinion was informed as to whether Kim and the Bazarjani combination discloses this last element of claims 1, 2, and 3?

A. So Kim discloses a processor controlling the cancellation process. And it would have been obvious that it would have been either open loop or close loop. There is only two. So

it would have been obvious that it could have been closed loop. And, in fact, since it's disclosing an RF solution as well, you really only can use a closed loop solution in RF. You don't have the digital pieces to do an open loop solution.

So the starting point of that processor in Kim is closed loop. It's there. And in doing it digitally, you would, of course, do it closed loop as well as -- as one of two options.

Q. Now, does it -- the language of controller controls the variable phase shifter and the variable attenuator, does that language inform your opinion?

A. Yes. The controller controls the phase shifter and the attenuator so that the intermodulation product signals generated from the front end receiver and the intermodulation product generator may have the phase offset of 180 degrees. So it maintains that difference of 180 degrees, and the same magnitude. So it's not enough to be half as tall. It won't cancel it out. It's got to be the same height.

And then, of course, the use of the controller to control the adjustment of the precise phase and amplitude of the IMD product signal allows for more effective cancellation of the IMD products in a practical environment since in the real world the interference signals and the resulting IMD products are variable parameters. Controller 312 ensures that the undesirable IMD products are substantially eliminated. So if things change, it will keep them -- keep them nulled.

Q. Now, with respect to the means for performing phase adjustment and amplitude adjustment and the phase and amplitude adjustor, did the Court provide additional constructions?
A. Yes.
Q. We've talked about the function. But in terms of the structure, what's the structure that's required by the Court's construction?
A. The structure is a processor programmed to convert original samples to new samples using weighted interpolation to map the new samples into time slots of the original samples and adding the amplitude by scaling.
Q. So is that structure disclosed by the -- or rendered obvious by the Kim and Bazarjani combination?
A. Well, certainly under the Finesse's accusations, that if -- if Nokia's products infringe, essentially they're doing it the same way in terms of a phase shifter as this so it would be doing it. But right on this page it says that the amplitude and precise phase adjustment is controlled by the processor. There's a number of ways to implement it, and it would be obvious to implement it with this interpolating filter because it's got a decimating filter already and decimating filters interpolate, so one could use that type of a structure to do it.
Q. And so then what's your -- the summary of your opinion

regarding whether Kim and Bazarjani render obvious claims 1, 2, and 3 of the '134 Patent?
A. It discloses all those limitations.
Q. And is there a motivation to combine those references?
A. Yes. The whole digital evolution of the world at that time, including where I spent my career.
Q. So now we have here DX 19, a patent to McCalister and DX 40, the Lui article we talked about earlier. Do you see that?
A. Yes.
Q. So can you give us a summary of what your opinion is with respect to the asserted claims of the '775 Patent?
A. Sure. The McCalister disclosure, the 298, by itself discloses the '775 Patent by itself, and even more obviously with this Lui reference which describes the specific mathematics.
Q. And the specific mathematics, what do you mean by that?
A. Well, it describes a formula of a power series which is part of the limitations. One reading McCalister would understand it's there. Lui just makes it very, very clear.
Q. So now McCalister, what's the filing date on McCalister?
A. McCalister was filed in 2007.
Q. January 30th, 2007. Is that right?
A. Yes.
Q. And McCalister for the record, DX 19, is United States Patent 8,805,298. Is that right?

A. Yes.
Q. Is there any dispute as to whether the McCalister reference is prior art to the '775 Patent?
A. No, there's not.
Q. Now, with respect to this McCalister reference here, did the patent examiner have the McCalister reference, this McCalister reference, when it was -- when that patent examiner was considering whether to issue the '775 Patent?
A. No.
Q. So tell us generally what the McCalister reference teaches.
A. The 298 McCalister teaches a transceiver includes an RF transmitter and an RF receiver coupled together through a duplexer, either device may leak significant portions of the transmit signal into the receive signal, and then it teaches intermodulation products may be digitally canceled from that problem.
Q. And now we talked about Lui a little bit earlier, but can you remind us at a high level what the Lui article teaches?
A. Yeah, Lui was that very early reference, that very early paper from 1990, that talked about passive intermodulation distortion, in particular describes that Christmas tree of all of the -- all of the main source signals here in the middle and then all of the -- the intermodulations of different orders branching out from it.

It describes the non-linearity that's used to create them in the passive intermodulation, and then it also talks about how -- what kind of things generate them.

So I have an excerpt here talking about passive intermodulation products: PIMP generated by non-linear materials, metallic contacts, can cause serious radio interference. This problem is well known.

The paper gives an overview of the passive intermodulation interference in communication systems. It describes briefly the theory of intermodulations, the type of passive non-linearities, the mechanisms responsible for the generation of the PIMP, guidelines for minimizing that generation, and techniques for locating it. And that's what it is about.

Q. And this is from June of 1990. Is that right?
A. Yes, that's right.
Q. Is there any dispute as to whether the Lui article is prior art --
A. No.
Q. -- to the '775?

And was the Lui article -- did the patent examiner have the Lui article when they were considering whether to issue the '775 Patent?
A. No, he did not.

MR. NELSON: Now, if we could just put up briefly PX

4, which is the '775 Patent, and go to the last page.
Q. (BY MR. NELSON) So here the '775 Patent has 40 total claims. Right?
A. Yes.
Q. And are you offering invalidity opinions with respect to all 40 of those claims?
A. No, I'm not.
Q. Which ones?
A. Just the ones that are asserted in this case.
Q. Okay. And there are -- you understand there are seven asserted claims?
A. Yes, that is right.
Q. So then even if the jury were to agree with you that the McCalister and Lui combination renders obvious those seven claims, how many claims would be left?
A. 33 claims would be left.
MR. NELSON: So if we could go back to the presentation. We can start at slide 87.
Q. (BY MR. NELSON) So do you believe that one of ordinary skill in the art back in the January 2007 time frame would have been motivated to combine the teachings of McCalister and lieu?
A. Yes. Lui is teaching about how passive intermodulation occurs, and McCalister is teaching about how to correct it. Lui is describing the mathematics behind it. McCalister is

implementing those mathematics. It would be obvious to combine them.

Q. So now we'll talk about claim 1. So in terms of your presentation, have you done a similar organization for the '775 Patent that we just went through for '134?

A. I have, yes.

Q. And what is that, generally?

A. Well, just -- we're going to go through each limitation for each of the common limitations at the same time. So we're not looping around; we're just going to go through them together.

Q. In other words, we won't repeat.

A. Correct.

Q. Okay. So if we look then -- and let's look into the limitations of claim 1 first. And the very first part, the preamble that we talked about, "a method for performing interference cancellation in a receiver with a transmitter and the receiver being co-located with each other, the method comprising", is that disclosed in the McCalister and Lui combination?

A. Yes, it is. You can see on the bottom right there is a transmitter and a receiver right here together--transmitter, receiver, one antenna. They are co-located. You can also see in the text that I've included, The present invention relates to the field of transceivers in which a transmitter and

receiver is physically located near one another. The method calls for obtaining an RF cancellation signal derived from the RF signal. A digitized cancellation signal stream is formed by being derived from the RF transmit signal--the source signal. The digitized cancellation signal stream and the digitized receive signal stream are combined to form a digitized leakage compensated receive signal stream.

Q. So now if we focus in on the first element, 'generating intermodulation product cancellation signals' and continuing, do you have an opinion as to whether the McCalister reference discloses -- the combination of Lui and McCalister disclose that first element?

A. I do, yes. It is disclosed.

Q. And can you -- with respect to the generation of the intermodulation product cancellation signals, can you tell us where that is?

A. Yes. So I have some excerpts here. A portion and preferably a very small portion of RF transmit signal is extracted at the coupled point of a directional coupler and routed to a splitter where it is then routed to control inputs of a transmitter feedback control circuit. That's this pink line here. And there's the splitter.

And then it goes on, "RF transmit signal 20 is canceled from RF receive signal 44 in response to processing performed in receive feedback control circuit. In particular, receiver

feedback control circuit is configured to compensate RF receiver for the leakage portion of the RF transmit signal in response to RF transmit signal obtained through directional coupler and splitter and in response to digital data stream receiver feedback control circuit."

So the splitter goes through here and then it comes into this receiver feedback control circuit.

Q. So now -- and is that done in the receiver continuously near real time using copies of the transmitter signals?

A. It would have to be, yes.

Q. And that's shown here?

A. Yes.

Q. Okay. Now, if we move to the next two elements, 'Wherein the passive IMPs are generated in passive transmitter', and continuing and then the element [c], "wherein the transmitter filter is coupled between the HPA and an antenna used by the transmitter", do you have an opinion as to whether the McCalister and Lui combination shows that?

A. Yes.

Q. And you read all that, so just explain this to us.

A. Okay. Sure. So you see a power amplifier right here. Okay? And then you see an antenna right here. So all this duplexer and filter are between the two. So element [c}, transmit filter, that is right here, transmit isolation filter right there, that is between those two. So this element is

there.

And then, "wherein the passive IMPs are generated in passive transmitter components of the transmitter, so the duplexer is right here and there are distortions that are generated in this transmit isolation filter, the duplexer. And that's in this text. So some such transceivers utilize transmit signals extracted upstream from the duplexer for use as a reference signal for the cancellation and a version of the transmit signal that interferes with the receive signal is influenced by the duplexer distortions. The duplexer distortions right there. Since the duplexer distortions -- I can't read it now. Since the duplexer distortions are not accounted for in the reference signal, the resulting cancellation is less effective than it might be. So that's the prior art. That's what has been done.

And now what is being done, when narrow band interfering signals are near the receive band, any non-linear processing in the receiver input circuits such as amplifiers and/or mixers causes some degree of cross modulation which produces intermodulation products in the receive band when the transmit band energy and/or the nearby narrow band interfering energy are relatively high at the front end of the receiver which receive band intermodulation products can be considerably greater than the energy of the receive signal itself --

So, in other words, that CDMA signal we saw earlier that

has the jammers in it, that's what we're talking about, and the duplexer we've been talking about we know causes intermodulation distortion.

Q. Okay. So that in your opinion, are those elements [b] and [c] disclosed in the combination of McCalister and Lui?

A. Yes.

Q. So now let's look at the last one, which includes the three signals --

A. Yes.

Q. -- limitation that we've looked at earlier. So is the -- let's start with the McCalister reference. Is the -- does the McCalister reference disclose this last element?

A. It does. It does. It does because you see the front end block here, figure 1, and then you see this tan block in the middle, figure 12 is that block blown up. That's the insides of it. And the signal comes in here, and there's this box called basis function generator. And a basis function generator generates the intermodulation products from the signal coming in.

And it goes through these different stages which produce different weightings and phase shifts which then come out here, and that's the intermodulation estimate. That's the error estimate that gets added back in. You can see some of the math here on column 22, line 53. And one example, one

basis function is roughly equal to I times the magnitude of I, and another basis function is roughly equal to I times magnitude squared to the I. Those are terms that are intermodulation distortion terms where I represents the input signal, the cancellation signal stream, and M of I represents the magnitude of the input signal.

And then on the right-hand side talks about digital equalizers are configured to cancel non-linear intermodulation and harmonic products. Each of the equalizers applies its own transformation function and its own basis function. So each of these uses another term like I magnitude of I, I magnitude of I squared. And so that's teaching generating these terms, but it only has a single input. However, multiple signals can be inside of that as Lui teaches.

Q. So now let's look at Lui with respect to that particular issue. So how would the teaching of Lui inform the issue that you just discussed?

A. Yes. So in Lui, Lui describes two unmodulated signals of frequencies F1 and F2. There's this equation here to, you know, signal 1 is a cosign and signal 2 is a cosign. And then this box says you have to substitute this into all these Vs and calculate it.

And when you do that, the squared term and the cubed term -- well, the cubed term would be the third order intermodulation products. That would be taking the two terms

and it would be doing the same math as applied to the Nokia products if it had two inputs.

So if two inputs allows Nokia to infringe, then the patent, the '775, is invalid because of the two signals that this one teaches. So this is doing what Finesse is claiming Nokia is doing.

Q. So just to be clear, do you believe that what you just described meets the Court's claim construction as we talked about earlier?

A. Well, I believe that if you can identify three separate signals, the Court's claim construction, then in -- in Nokia's products, then you could do it here as well.

Q. Right. But you talked about earlier your opinion with respect to whether there were three separately identifiable signals in the Nokia products. Right?

A. Yeah. And there are not.

Q. Okay. So then let's just be real clear. What are you saying with respect to the combination of McCalister and Lui with respect to the three signals construction?

A. Yeah. This does not disclose three separately identifiable signals just like the Nokia product does not disclose three separately identifiable signals. It does the same -- same thing in that way.

Q. But then if the jury were to conclude that two signals is sufficient, what does that tell you about the disclosure of

McCalister and Lui?

A. Then the patent's invalid.

MR. GRINSTEIN: Your Honor, objection.

THE COURT: Just a moment.

MR. GRINSTEIN: Your Honor, objection. That question is rearguing claim construction.

THE COURT: What's your response, Mr. Nelson?

MR. NELSON: I didn't reargue claim construction. I was just taking Doctor Wells' opinion that we talked about earlier and said if that's sufficient, what does that tell you about this disclosure. So that's not claim construction.

THE COURT: I'll allow the question.

MR. NELSON: Thank you, Your Honor.

THE COURT: Either restate the question or move on.

Q. (BY MR. NELSON) Okay. So if you take Doctor Wells' opinion regarding the Nokia products and whether the three signals limitation is met and apply that to the McCalister and Lui combination, what does that -- what conclusion --

A. It would be invalid under Doctor Wells' theories.

Q. Okay. So then -- and why is that?

A. Because the two signals disclosed here are similar to the two signals disclosed in the Nokia products.

Q. Okay. So now --

THE COURT: Mr. Proctor, be sure you let counsel finish his question before you jump in with your answer.

Okay?

THE WITNESS: Yes, Your Honor.

THE COURT: All right. Please proceed.

MR. NELSON: Thank you, Your Honor.

Q. (BY MR. NELSON) So now if we go to -- and now we've covered all the elements of claim 1. So now we compare claim 1 to claim 4, can you tell us what you're showing here?

A. I'm showing the similarities and differences between claim 1 and claim 4.

Q. And so the similarities, are those the things that we've already covered with respect to claim 1?

A. Yes.

Q. Okay. So now with respect to the black language, you said that was different in claim 4?

A. Yes.

Q. So now if we look at the language and start with the a priori knowledge of a transmitter signal set, is that disclosed in the McCalister and Lui combination?

A. It is, yes, because the signal is being -- their own transmit signal is being looped back in. So it's disclosed, the McCalister transmitter signal.

Q. Okay. So the next piece, in a baseband digital signal set of, is that disclosed, that additional limitation disclosed in the McCalister reference?

A. Yes, because this is a digital process. It's disclosed

as digital.
Q. Is it baseband?
A. Yes. The citations I have show that, that the method calls for RF cancellation and that a digitized cancellation signal stream is formed by being derived from the RF transmit signal and the digitized cancellation stream essentially it's digital and it's being done in the same -- in a similar manner to what -- how Nokia is doing it, and -- and it's being done as a digital baseband system.
Q. So I don't -- it's done in a similar manner or Nokia's doing it? I don't -- can you explain that to me?
A. Yeah, I -- I was imprecise. So it's being done digitally. It doesn't disclose if it's at -- it's being done at a carrier frequency, an offset, just like Nokia's products is doing it. So the -- that receiver feedback control circuit that's generating the products is being done offset from zero Hertz, which is the baseband, at an IF just like Nokia's products are.
And so to the extent that Nokia's products, the GROOT, to the extent that that's the baseband processor, then so is the receive feedback control circuit. But -- so if GROOT infringes, then it would be invalid. This patent would be invalid under McCalister's disclosures.
Q. So let's just be real clear, though. Is it your opinion that the GROOT FPGA is a baseband processor?

A. No, it's not the baseband processor.
Q. Okay.
THE COURT: Counsel, approach the bench, please.
(The following was had outside the hearing of the jury.)
THE COURT: We're 2 hours and 15 minutes into this gentleman. How much more have you got.
MR. NELSON: Probably 15 minutes, Your Honor.
THE COURT: And then you've got an hour of cross?
MR. GRINSTEIN: At least.
THE COURT: I want to get this guy off the stand today, but I'm not prepared to stay up here until 7:00. We are going to take a short break and then come back and see if we can move it along.
MR. NELSON: Okay. Thank you, Your Honor.
(The following was had in the presence and hearing of the jury.)
THE COURT: Ladies and gentlemen, we're going to take a short recess. This will be the last one for the day. You can simply leave your notebooks in your chairs, follow all my instructions, and we'll be back here shortly to continue.
The jury's excused for recess.
(Whereupon, the jury left the courtroom.)
THE COURT: The Court stands in recess.
(Brief recess.)

THE COURT: Be seated, please.

Mr. Nelson, are you prepared to continue with this direct examination?

MR. NELSON: Yes, I am, Your Honor.

THE COURT: Let's bring in the jury, please.

(Whereupon, the jury entered the courtroom.)

THE COURT: Welcome back, ladies and gentlemen of the jury. Please be seated.

All right, Mr. Nelson. Let's continue with your direct examination of Mr. Proctor.

MR. NELSON: Thank you, Your Honor.

Q. (BY MR. NELSON) So now I want to focus in on these last two differences: "Wherein digital copies of the transmitter signal side are (unintelligible) the receiver, and wherein the transmitter filters are configured to significantly reduce active IMPs in a band of a passband receiver."

Can you tell us how those differences in claim 4 or those additional limitations in claim 4 are disclosed in the McCalister and Lui combinations?

A. Yes. The references I have on the screen discuss those limitations and the digitized cancellation stream. In particular, "The digitized cancellation signal stream and the digitized receive signals are combined to form a digitized leakage compensated receive signal stream," and that discloses -- that, of course, is generated based upon passing

the digital transmitter signal set to the receiver. So that is satisfied.

And then, "Wherein the transmitter filters are configured to significantly reduce active IMPs in-band of the passband of the receiver", you can see there is a duplexer. So when you have an active intermodulation, we haven't talked about that much, but that comes from a power amplifier, and you create that Christmas tree around the transmit signal before it happens, before it goes through this filter. So you have this transmit filter and the power amplifier here. So an active intermodulation is happening at that power amplifier, and so you have that little Christmas tree thing here.

And this filter, when it goes through it, will take it out of the receive band because that's what a duplexer does. The duplexer takes the transmit signal, puts it on the antenna, and then the receive filter tries to take that off, and so it would remove the -- the stuff that's going to the transmit filter.

Q. So in claim 9, the dependent claim, there's the additional limitation of "wherein generating the odd order ICSs comprises digitally multiplying and filtering an odd number of digital signals up to n in number from the transmitter signal set." Do you see that?

A. Yes, I do.

Q. So is that disclosed in the McCalister and Lui

reference -- or the McCalister and Lui combination? I apologize.

A. So that would require three signals, and so this is talking about two in Lui. And so just like we talked about previously, given three signals and the construction of that, under the infringement theories under Doctor Wells' theories, there were only two disclosed. So if Nokia's products infringe, there are two disclosed here.

So this patent would disclose -- would be invalid, the '775, this limitation would be demonstrated by Lui if it's found that Nokia's products infringe. So it's one and the same.

Q. And when you say under Doctor Wells' infringement theory, meaning if you stretched the claims to that breadth --

A. Yes.

Q. -- if that's the way they're applied, then they -- that's disclosed in the prior art. Is that what you mean?

A. That's what I mean, exactly.

Q. So now let's move forward then claim 16 will be the next claim, and we have the dark language highlighted here, the black language in claim 16. Is that the additional limitation of claim 16?

A. Yes.

Q. So now let's focus on that, receiving a digital copy of a transmitter signal at a receiver.

A. Yes.
Q. Is that disclosed in the McCalister and Lui combination?
A. It is. You can see in this picture the transmit signal is coming back into this splitter and then -- it's so hard to see, but into this small box is -- thank you. So this 20 is going into the receiver feedback control circuit, and that is disclosed as being done digitally in -- in McCalister and that's part of the receiver and, therefore, that's disclosed.
And on this figure, you can see it's coming in here. This is the transmit signal coming in and -- into the basis functioning generator and it's part of the receiver. And so -- so that element is disclosed in McCalister.
Q. So now if we move forward to claim 21 and the additional limitations of claim 21 beyond claim 1, a transmitter, a receiver co-located with a transmitter, and circuitry to perform interference cancellation in the receiver, the circuitry configured to, did you analyze those additional limitations in claim 21 to see whether they were present or disclosed in McCalister and Lui combination?
A. Yes, I did, and -- and they were present. The transmitter is clearly present. We've talked about that previously. The receiver is clearly present. We've talked about that as well. And then the circuitry to perform interference cancellation is, of course, this feedback. And then the -- there is a summer to perform the canceling right

here, actually this whole section because it has multiple summers that take this cancellation signal and -- and null out the interference and then off it goes to a baseband processor.

Q. So now with respect to claim 23 and -- and claim 29, the additional limitations, the dependent limitations of claim 23 and 29, are those disclosed in the McCalister and Lui combination?

A. Yes. We know that the digital signals into the distortion generator in that receiver feedback block are digital, so it has to be capturing the analog signals at the output of the transmitter. That has to occur.

And then they're down-converted to generate the ICSs.

Q. And the down conversion that you -- is that the decimation that you explained earlier?

A. Yes.

Q. Now, then with respect to the additional element, let's take that first one, generate the odd order ICSs by digitally multiplying an odd number of signals up to and in number from the transmitter signal set. Did we just discuss that?

A. We discussed that exact limitation, and so for the same reasons it would be invalid under the -- the infringement theories.

Q. And that was -- so the -- this additional element of claim 29 is the same as the additional element of claim 9. Is that right?

A. Yes, that's right.
Q. Okay. Now, so let's take that last one, filter the results to selectively create nth order active ICSs. Do you see that?
A. Yes.
Q. Is that additional limitation shown in the McCalister and Lui combination?
A. So we already talked about intermodulation -- active intermodulation from the power amplifier being filtered out. To the extent that it keeps going through and gets into the receiver which can happen, it can overcome the filter if it's too large, it could be canceled at the same circuitry because there is no difference. Once it's a third order intermod, if it's happening in the front end or the power amplifier, you can't separate it. You have to just null both of them. And so that would be disclosed here. And the nth order being a third order, you see there's many orders here in this equation. There's a second order, a third order, and so on and so forth in that power series.
Q. So now moving to claim 36, a transmitter, a co-located receiver and circuitry configured to, we talked about that earlier with respect to claim 21.
Now, there's also the additional element in claim 36 of receive a digital copy of a transmitter signal at the co-located receiver. Do you see that.

A. Yes.
Q. Now, is that -- you've talked about the first three with respect to claim 21. But now focusing on the new one in claim 36, can you tell us how that's disclosed in the McCalister and Lui combination?
A. Yes. We've again have -- there were similar limitations earlier, and we know that this receiver feedback control circuit is being done digitally. And, therefore, taking a copy of the output and then digitizing it would give you a digital copy of the transmitter signal into the receiver.
Q. So then in your opinion, are all of the limitations of asserted claims 1, 4, 9, 16, 21, 29, and 36 rendered obvious by the combination of McCalister and Lui?
A. Yes, they are.
Q. Now, have you heard of something -- the concept of secondary considerations?
A. Yes.
Q. And can you just explain to us briefly what your understanding is of secondary considerations?
A. So there are principles that one can examine to determine if something should be valid or if something should be invalid with respect to an invention.
Q. So, for example, if there are unexpected results by putting a combination together, would that be something --
A. Yes.

Q. -- that's a -- or a departure from accepted wisdom?
A. Yes.
Q. So do you understand in this case that Finesse has argued that there were unexpected results or -- and a departure from accepted wisdom with the claimed inventions of the '134 and '775 Patents?
A. Well, I heard that they were expecting 5 dB and got 10 or 15 in some cases. I can tell you that's not unexpected in my experience.
Q. And why do you say that?
A. Well, in our cancellation loops that I implemented at Spectrian, if we didn't have 40, we wouldn't ship the product. And these were very high power amplifiers. And I've built other products with cancellation loops, too, where you take a reference and cancel intermodulation distortion. High power amplifiers -- well, I'll leave it at that for now.
Q. So now here with respect to figures 2 and 4 in the Lui patent, can you tell us whether this idea of finding interference signals and canceling intermod signals was a new idea?
A. It was not a new idea. Lui is 1990.
Q. 1998. Lui was filed in 1998. Is that right?
A. Well, no, I mean, the -- the article. The article Lui.
Q. Oh, excuse me. You're correct. You're correct. I had Kim in my mind.

THE COURT: Gentlemen, let's make sure that one's finished before the other one starts. This is not a conversation on the street corner. It's an examination on the record in a United States District Court. There are questions asked, and when those questions are finished, answers are given. And when the answers are finished, the next question is asked. This is not a back and forth like a conversation out on the corner.

MR. NELSON: Understood, Your Honor.

THE COURT: Let's proceed on that basis.

Q. (BY MR. NELSON) So with respect to the Lui reference, can you tell us how that informed your opinion regarding whether there were unexpected results or departures from accepted wisdom?

A. Well, clearly intermodulation distortion had been known for a long time. Right? Well before 1990. And so it does not surprise me and it would not be surprising that people were trying to correct it.

Q. So now with respect to figures 2 and 4 of the Kim patent, how does that inform your opinion as to whether finding interference signal and calculating intermod products were -- was a new -- had unexpected results or a departure from accepted wisdom?

A. Kim was teaching doing it and canceling out. And by doing it, I mean canceling the intermodulation products from

passive intermodulation out of a desired receive signal. It was teaching doing it; therefore, it should not be surprising that -- that that's a desirable goal.

Q. So now did you hear the testimony from Mr. Smith that he went to a number of companies?

A. I did hear that.

Q. So do you think that that was evidence of acceptance by the market or commercial acquiescence or anything like that?

A. No. No. If you have a good idea, these companies will respond to you. It needs to be an idea that is -- is well-protected and -- and the timing needs to be right. It just was not.

Q. And is practicality a consideration in that?

A. It is.

Q. And -- and can you explain that?

A. Yeah. If it's not implementable, you can have the greatest idea in the world, but if you can't implement it, it's not worthwhile to somebody who needs to ship a product. These people are looking at putting time into building a product and making a profit on it. And if they're trying to do too much, like capture everything, they won't do it because they can't make money because the customers aren't demanding it.

Q. Thank you, sir. I appreciate your time.

MR. NELSON: And I pass the witness, Your Honor.

THE COURT: All right. Cross examination by the Plaintiff.

MR. GRINSTEIN: Your Honor, may I approach the witness to give the witness witness binders?

THE COURT: Yes, you may.

CROSS EXAMINATION

BY MR. GRINSTEIN:

Q. Good afternoon -- good evening, Mr. Proctor. My name is Joe Grinstein. I represent Finesse Wireless in this case. It's nice to meet you from 10 yards away.

Sir, you've never testified in a case involving -- in a case concerning passive intermodulation. Correct?

A. No, I have not.

MR. GRINSTEIN: Can I see Defendant's DDX 3, please, Mr. Boles?

Q. (BY MR. GRINSTEIN) You remember you put up this slide during your direct examination concerning the firms that you've worked for.

A. Yes.

Q. And I think the last one you've got on here is Proxycom. It says 2011 to present. Is that right?

A. Yes.

Q. But you're not here working for Proxycom right now, are you?

A. No.

Q. In fact, you are here for another firm that's not on this list, which is called Proctor Consulting. Right?
A. Yes.
Q. You didn't put Proctor Consulting on this list, did you?
A. Well, no.
Q. Proctor Consulting is the consulting business by which you do your expert work. Correct?
A. And consulting work.
Q. But a lot of what you do in Proctor Consulting is expert witness work like you're doing today. Right?
A. Yes.
Q. And you attached a resume to your expert report or a CV, however you want to call it, listing the various cases in which you've provided expert testimony before. Right?
A. I did, yes.
Q. I counted it up. It looked like about 33 different cases that you've provided expert testimony before that you put on your CV. Is that about fair?
A. That's probably about right.
Q. And in almost all of those cases, you provided expert testimony for Defendants. Right?
A. For most of them, yes.
Q. I mean, I counted up -- I can only find like one or two cases where you've ever provided an expert opinion for a plaintiff. That's about right, isn't it?

A. It's probably more than that, but that's fine.
Q. The only ones I saw on your resume in which you provided expert opinions for plaintiff were BlackBerry versus BLU in a patent case and the SmartSky case, a trade secret case. That's it. Right?
A. I can't really recall, but that's probably about right. I think there's more, though.
Q. And in those cases in which you provided testimony for a defendant, you've often testified that a plaintiff's patent is invalid. Right?
A. Well, if my opinion is that they are valid, they would not ask me to testify, and that's happened.
Q. In the cases in which you have represented or provided testimony on behalf of defendants, you have often provided testimony that a plaintiff's patent is not valid. Correct?
A. Correct.
Q. Just like you're doing today.
A. Yes.
Q. And as far as I can tell, you have never provided an expert opinion in all those 33 cases that a plaintiff's opinion was valid -- a plaintiff's patent was valid. Right?
A. I would not because I would never be asked to render an opinion if it was that they were valid plaintiff patents if I were being asked to be the opposing expert. And that's happened, and so I was not hired.

Q. So 33 cases you've been an expert witness before, zero you've ever testified that a plaintiff's patent was valid. Right?
A. Well, no. I've been an expert in more cases than that, and some cases I never testified because I chose not to do that.
Q. There are 33 cases on your resume. Correct?
A. That I've testified.
Q. And in those 33 cases, zero have you testified that a plaintiff's patent is valid. Correct?
A. Correct. I have not testified in the ones in which I was asked to testify in that the patents were valid.
THE COURT: Mr. Proctor, you answered it when you said correct. You need to limit your answers to the questions asked. Okay?
THE WITNESS: Yes, Your Honor.
THE COURT: Thank you.
Let's proceed.
Q. (BY MR. GRINSTEIN) And, in fact, you yourself have got like more than 320 patents yourself. Right?
A. Correct.
Q. In fact, that's one of the reasons you say you're qualified to be an expert in this case because you've got so many patents relevant to this case. Right?
A. Well, no. It's the knowledge I used to generate those

inventions that are patented.

Q. In fact, companies you have been associated with have previously filed lawsuits asserting patents on which you're an inventor. Right?

A. Yes.

Q. And you have participated in those lawsuits. Right?

A. Yes, I have.

Q. And I assume in those lawsuits, you never said your own patent was invalid. Right?

A. Well, no.

Q. So it's true, is it not, that you spend a considerable part of your professional time seeking to invalidate other people's patents but not your own. Fair?

A. No, it's not fair.

Q. I take it you're very familiar with the process by which an inventor applies for a patent. Correct?

A. I am familiar with it.

Q. And one of the things an inventor has to do is to disclose to the Patent Office important prior art so the Patent Office can tell if a patent's valid. Right?

A. Yes.

Q. And that's what you always do --

A. Absolutely.

Q. -- when you're applying for a patent. Right?

A. Yes.

Q. And, in fact, on at least two occasions, you have cited as important prior art to the Patent Office Mr. Smith's '775 Patent. Isn't that true?
A. I disagree with your statement.
Q. Isn't it true that on two occasions you have cited to the United States Patent and Trademark Office as prior art at least the patent application that led to Mr. Smith's '775 Patent?
A. I have disclosed my duty to disclose. I've done that, yes.
Q. And in fulfilling your duty to disclose, you disclosed to the Patent Office the application that led to the '775 Patent that you say here at least these claims are no good. Right?
A. That's not the goal. The goal is to disclose.
Q. Mr. Proctor, did you on two occasions cite to the United States Patent and Trademark Office the application that led to Mr. Smith's '775 Patent as prior art to your own application?
A. I do not recall doing it, but if you say so, I'm sure I did.
MR. GRINSTEIN: Your Honor, I'd like to provide a document to the witness to refresh his recollection. May I approach?
THE COURT: You may approach the witness.
Q. (BY MR. GRINSTEIN) Mr. Proctor, I put in front of you U.S. -- or do you see in front of you U.S. Patent 8,422,540?

A. Yes.
Q. And that is a patent in which you are a named inventor. Right?
A. It is.
Q. And if you turn to page 3, there's a column of prior art. Do you see that?
A. Yes.
Q. And towards the bottom of that column of prior art, do you see a reference that refreshes your recollection that you cited to the United States Patent and Trademark Office the '775 Patent application?
A. You're going to have to help me out a little bit.
Q. About 10 lines up from the bottom on the left side, there's a reference to Smith, 754. Do you see that?
A. Yes. I wouldn't recognize the patent number, but, yes.
Q. That is Mr. Smith's '775 Patent right there, isn't it?
A. Well, the application. I wouldn't recognize the application number.
Q. But it is the application. Correct?
A. If you say so.
Q. And today you've asserted that the combination of the McCalister and the Lui references invalidate Mr. Smith's '775 Patent. Right?
A. Yes, I have.
Q. You didn't cite McCalister or Lui in your '540 Patent,

did you? You just cited the '775.

A. Well, because they're -- well, first of all, I'm not sure I actually disclosed it. I have a co-inventor who could have disclosed it.

Second of all, I don't know that I even needed to disclose it because the limitations of these claims are very different than the limitations of these claims. But in abundance of caution, I always disclose everything I think is even remotely relevant. And I'm not sure I even was aware at that time of McCalister.

MR. GRINSTEIN: Your Honor, objection, move to strike as non-responsive.

THE COURT: Sustained.

Again, Mr. Proctor, you're going to need to limit your answers to the questions asked. Mr. Nelson is going to get another chance to come back up there and ask you anything else he needs to follow up on. So please limit your answers to the questions asked.

THE WITNESS: Yes, Your Honor.

THE COURT: If he thinks you need to elaborate, Mr. Nelson will ask you additional questions for you to elaborate. It's the lawyer's choice, not the witness' choice. Understood?

THE WITNESS: Understand, yes, sir.

THE COURT: Let's proceed.

Q. (BY MR. GRINSTEIN) When you were prosecuting the '540 Patent and disclosing prior art, you did not disclose the two references you say invalidate the '775 Patent, McCalister and Lui. Correct?
A. I don't know. I haven't looked at them.
Q. Sitting here today you have no idea, do you?
A. Nope.
Q. Okay.
MR. GRINSTEIN: Your Honor, in light of that, I move for the admission of the document I just used to refresh recollection.
THE COURT: The time for admission of exhibits has passed. The Court considers it a demonstrative.
MR. GRINSTEIN: Thank you, Your Honor.
THE COURT: So for the record your request is denied.
MR. GRINSTEIN: You can take that down, Mr. Boles.
Q. (BY MR. GRINSTEIN) One of the accused products in this case is the AHFIB. Is that correct?
A. Yes.
Q. And in that product, baseband processing is performed digitally. Correct?
A. In the -- yes.
Q. Same for the AHLBA?
A. Yes.

Q. Same as for the AHLBBA?
A. Yes.
MR. GRINSTEIN: May I please see Mr. Proctor's direct slide No. 19?
Q. (BY MR. GRINSTEIN) Do you remember testifying about this particular slide, sir?
A. Yes.
Q. Can antennas cause PIM?
A. Yes.
Q. Where is the antenna on this picture?
A. Well, there's no antenna -- there's no complete picture here.
Q. Where would you put the antenna, on the internal or external side?
A. That would be internal PIM.
Q. Okay.
MR. GRINSTEIN: Can we go to Mr. Proctor's direct slide 27?
Q. (BY MR. GRINSTEIN) And then that is confirmed, of course, by this picture on 27 if you look in the upper right corner where it says antenna. Right?
A. Yes.
Q. And this is --
MR. GRINSTEIN: If you could blow that back out, please, Mr. Boles.

Q. (BY MR. GRINSTEIN) This is a figure from the GROOT specification that we're looking at on your slide 27. Correct?
A. Correct.
Q. It says it's from DX 287. I think it's been referred to as figure 1. Is that correct?
A. I'm not sure.
Q. You've labeled a red line there, transmit signals. Do you see that?
A. Yes.
Q. And what you've labeled there is a copy of a transmitter signal of a transmitter. Right?
A. It's a transmit signal, yes.
Q. But it's the copy of a transmit signal. Correct?
A. No, it's the transmit signal.
Q. Do you see that red dash line?
A. Yes.
Q. And there is a red arrow you put up there to the word 'transmit signal'. We are on the same place. Correct?
A. Yes, uh-huh.
Q. There is -- I think you even testified to this on direct. If you follow the red line to its origin, you hit a coupler. Right?
A. Yes.
Q. And that coupler couples off a transmit signal that then

follows that red path. Right?
A. Correct. It's the transmit signal.
Q. Now, it's not the only transmit signal or else this device would never talk to anybody. Right?
A. I don't understand your question.
Q. By coupling off something on that red path, it is coupling off a copy of the transmit signal. Correct?
A. No.
Q. The only transmit signal in this entire figure 1 is being sent back into the receiver and never goes anywhere else? Is that your testimony?
A. No, it's -- you're splitting it, so you're taking -- it's an analog signal, it's an RF signal. I'll explain more if you want.
Q. It's -- so the signal is getting split, which results in a transmit signal that is going out to the antenna and out to a user and also a transmit signal that is following that red path. Correct?
A. It's the same signal, yes.
Q. It's a copy of -- there was one signal before it hit that splitter and now there's two signals?
A. No.
Q. So there was two signals before it hit the splitter?
A. I'm just not following your question.
Q. Let me put it this way. Is the transmit signal that

you're pointing to in this red line, does it have the exact same power as the other signal that comes off the splitter?
A. No. It's the same signal that's been coupled off the directional coupler, so it's the -- it's the transmit signal that's been coupled off. It says there, TX reference.
Q. Is there a DL(TX) in this system?
A. A downlink transmit signal, yes.
Q. Is that the exact same thing as the DL(TX) reference?
A. Yes.
Q. You see there's an RF ADC right there in the middle?
A. I do.
Q. Is that part of the transmitter circuitry of the radio or the receiver circuitry of the radio?
A. It's part of the receive chain.
Q. So this transmit signal is received into the receive chain via that red line?
A. Well, it's not receiving it.
Q. Is it RF ADC a receiver?
A. No.
Q. Can you look at Exhibit 827, Plaintiff's Exhibit 827 in your book? You'll see this is the same TI specification that you cited that's got a different exhibit number in your direct examination. Correct?
A. Yes.
Q. And this is a specification for that RF ADC we've been

talking about. Right?
A. It may be. It looks similar.
MR. GRINSTEIN: Can we blow up the line under 3 description, Mr. Boles.
Q. (BY MR. GRINSTEIN) It says, this part is a 14 bit 3.0 GSPS dual channel RF sampling telecom receiver. Do you see that?
A. Yes.
Q. TI says this part's a receiver, don't they?
A. Well, it says it can be used to receive, yeah.
Q. Does TI says it can be used to receive or does it call it a receiver?
A. It calls it a receiver. That's what it's being sold for.
Q. All right.
MR. GRINSTEIN: Can we take a look, please, at Mr. Proctor's slide 30?
Q. (BY MR. GRINSTEIN) This is another slide you presented during your direct examination. Correct?
A. Yes.
Q. And it's entitled, Downlink and Uplink are Sampled in Separate Pathbands. Do you see that?
A. I didn't hear your question.
Q. Sure, I'm sorry. It's entitled, Downlink and Uplink are Sampled in Separate Passbands. Do you see that?
A. Yes.

Q. And the text on the left side is from a Nokia specification and the figures on the right side you added to help explain. Correct?

A. Yes.

Q. And you added a line that says, Downlink TX feedback sampled independently, and you pointed to the RF ADC. Is that correct?

A. Yes.

Q. And in that picture right above it you see those two up arrows in green?

A. Yes.

Q. Those two arrows in green are representing two signals. Right?

A. It's representing the transmit signal, yes.

Q. How many?

A. Well, there are two depicted there.

Q. That's X1 and X2?

A. Actually I don't think so. I think it's just two signals within that passband.

Q. What kind of signals are those?

A. Yeah. So those are transmit signals, and they're going through the ADC, but to do the other bands they come from a -- they're multiple channels. I only want to answer your question, so I'll stop there.

Q. I appreciate it. Thank you.

MR. GRINSTEIN: Can we please look at cross exam demonstrative 27, please, Mr. Boles?

Q. (BY MR. GRINSTEIN) Do you recall giving direct testimony maybe two hours ago stating, "What we heard earlier, the signal of interest is the signal, we're trying to receive it. It's the thing we don't have. It's what we want to know. Right? It's the transmission signal from the mobile phone back to the base station, so we're trying to figure that out" --

THE COURT: Mr. Grinstein, slow down, please. It's been a long day.

MR. GRINSTEIN: Thank you, Your Honor.

Q. (BY MR. GRINSTEIN) "That's what we're interested in."

Do you see your testimony from earlier?

A. Yes.

MR. GRINSTEIN: And now can we see cross exam demonstrative 29, please, Mr. Boles?

Q. (BY MR. GRINSTEIN) You also testified earlier, "The signal of interest is the signal you don't know that the base station is trying to get from the transmitter of your phone."

Did you testify to that earlier?

A. Yes.

Q. Mr. Proctor, as between yourself and the Court in terms of the definition of signal of interest, whose definition should the jury apply?

A. They should, of course, take the Court's construction.
Q. And the Court's construction can be found on cross examination demo 21.
That is the Court's construction of signal of interest, is it not?
A. It is.
Q. That construction of signal of interest doesn't mention anything about uplink, does it?
A. Well, it has 'receiver'.
Q. Does it say the word 'uplink'?
A. No, it does not.
Q. Does it say 'signal you're trying to get from the transmitter of your phone'?
A. No.
Q. Say anything about the transmitter of your phone; of any phone?
A. Well, it says 'receiver', and it's trying to receive, so yes, it does, actually.
Q. I don't see the word 'transmitter' in that construction. Do you?
A. Well, the word 'transmitter' is not in that.
Q. 'Phone' isn't in that either.
A. No.
Q. Hardly any of the words you used to define signal of interest to the jury in those two slides that I showed you are

in the Court's construction, are they?

A. No.

Q. And if Finesse proves that the group products meet that particular construction, at least as to that word that means there is infringement. Correct?

A. For what word?

Q. Let me try that again. I'm sorry.

You'd agree that if the Court's construction of signal of interest is met as opposed to anything you might have said about signal of interest, then that particular claim term is satisfied. Right?

A. That signal of interest would be satisfied if that's met; nothing beyond that.

MR. GRINSTEIN: Can I see cross exam demonstrative 28, please, Mr. Boles?

Q. (BY MR. GRINSTEIN) You also mentioned on your direct that the patent talks a lot about searching for the interference. Do you see that?

A. Yes.

Q. Search is not, in fact, part of any of the asserted '134 claims, is it?

A. It is not.

Q. The word 'search' doesn't appear anywhere in the three claims that are asserted in this case from the patent. Correct?

A. That term does not appear in it.

MR. GRINSTEIN: May I see the '134 Patent, please, Mr. Boles? And if you can go to the claims, please.

Q. (BY MR. GRINSTEIN) So there's claim 1. 'Search' isn't in there. Right?

A. No, it's not.

MR. GRINSTEIN: Can I see claim 13, please?

Q. (BY MR. GRINSTEIN) Now, this claim is not asserted by Finesse in this case. Right?

A. No, it's not.

Q. But 'search' does appear in this claim. Right?

A. Yes.

MR. GRINSTEIN: Can we please take a look at his demonstrative 27, please, Mr. Proctor's demonstrative?

Q. (BY MR. GRINSTEIN) Do you see the sentence that says "GROOT samples the transmit signals" you've got up top there?

A. Yes.

Q. The word 'samples', where is sampling done in GROOT?

A. In the analog to digital converter.

Q. And whatever comes into the analog to digital converter comes in an analog form and exits in digital form. That's what an ADC is. Right?

A. Yes.

Q. On the left side of this particular exhibit--or figure, excuse me--do you see the Nahka ASIC?

A. Yes.
Q. And the Nahka ASIC is a device that combines most of the digital baseband functions found in an NA RRH into one ASIC. Right?
A. Well, it's -- the baseband includes additional capabilities that are down in the base station at the bottom, so it's a piece of the base -- of the processor, the baseband processor, that includes at the bottom of the tower. That's where the demodulation's actually done.
Q. The Nahka ASIC doesn't contain 100 percent of the baseband functions found in a remote radio head. Correct?
A. Yeah, it doesn't have all of them. The rest are at the bottom of the tower.
Q. The other patent -- we've talked about the '134. The other patent that is asserted in this case -- I'm sorry, actually. I apologize.
MR. GRINSTEIN: Can we please take a look at PX 3, claim 1 of the '134?
Q. (BY MR. GRINSTEIN) You gave some testimony earlier today about the closed loop limitation of this patent. Correct?
A. Yes.
Q. There's nowhere in claim that mentions the word 'feedback'. Is that right?
A. It does not say 'feedback' in the claim.
Q. It doesn't say it in claim 2 or claim 3. Correct?

A. No. It says 'closed loop'.
Q. And the Court has construed various terms in this patent. Correct?
A. It has.
Q. And in none of the Court's definitions of this patent does the word 'feedback' appear.
A. Or 'closed loop'.
Q. Is that a yes--it does not appear in the Court's constructions?
A. Yes, it's -- yes, it doesn't appear in there.
Q. In fact, the word 'feedback' doesn't even appear in the '134 Patent at all, does it?
A. Oh, I don't know. I haven't looked for it. I mean, I have looked for it. I haven't seen it, but --
Q. So you would know if it appeared, but you haven't found it. Right?
A. It doesn't jump to mind. I didn't look for it specifically.
Q. The --
MR. GRINSTEIN: If we could go, please, Mr. Boles, to cross exam demo 23?
Q. (BY MR. GRINSTEIN) This particular slide mentions the Court's claim construction for three signals. Correct?
A. Yes.
Q. And it says, "Three signals must be separately

identifiable". Right?
A. Yes.
Q. But it goes on to say they're not limited to three unique input signals. Right?
A. Correct.
Q. So it wouldn't be proper to apply the Court's claim construction and say under the construction S1, S2, and S3 must each be unique input signals.
A. I'm sorry. Repeat that again. I don't think I got the double negatives.
Q. It would not be proper to apply the Court's claim construction and say S1, S2, and S3 must be three unique signals.
A. I think you said it doesn't require three unique input signals. Is that what you asked me?
Q. Let me try it one more time.
A. Okay.
THE COURT: If you don't understand the question, simply say, I don't understand the question. Don't tell him what you think you understood. Okay?
THE WITNESS: Yes, Your Honor.
THE COURT: Ask it again, counsel.
Q. (BY MR. GRINSTEIN) It would not be proper to apply the Court's claim construction and say S1, S2, and S3 must be three unique input signals.

A. No, I think that would be improper.
Q. So a system could have two separately identifiable input signals and that -- and not three, and that system could satisfy the Court's claim construction about three signals. Correct?
A. No.
Q. Let me ask that question one more time. A system could have two separately identifiable signals, not three, and yet still satisfy the Court's claim construction S1, S2, and S3. Right?
A. No. It says -- no.
Q. Then what meaning do you read into the phrase 'not limited to three unique input signals'?
A. You asked me if a system could have three -- I'm sorry. You said if a system has two separately identifiable signals it could satisfy the construction, and the construction says three signals, S1, S2, S3, the signals must be separately identifiable, so that requires three separately identifiable signals. If it doesn't have that, it doesn't meet the construction.
Q. Right. But can three separately identifiable signals be satisfied by using a signal twice?
A. No.
Q. Then what meaning do you provide to the phrase 'not limited to three unique input signals'?

A. They don't -- they can't -- they don't have to be unique and they -- but they -- and or -- they have to be -- they don't have to be three input signals that are unique, input signals that are. So there is two pieces to that--unique and input. So it's not limited. For instance, you could have one that comes in and split into three separately identifiable signals and that would satisfy it. But one coming in split into two would not.

MR. GRINSTEIN: Can I have cross examination demonstrative 25, please?

Q. (BY MR. GRINSTEIN) Mr. Proctor, if I was ordered to show you a dollar bill three times but I was told I don't have to show you three unique dollar bills, could I satisfy that by showing you this dollar bill once, showing you this dollar bill twice, and showing you this dollar bill a third time?

A. Not if it said input, but --

Q. I didn't ask that question, Mr. Proctor.

A. Okay.

Q. Do you see the order I've got right here? "Please show Mr. Proctor a dollar bill three times, but you do not have to show him three unique dollar bills if you don't want to." Do you see that?

A. I do.

Q. And would I satisfy that instruction by showing you this dollar bill once, showing it to you twice, showing it to you a

third time?

A. You would satisfy your sentence, yes.

Q. Thank you.

THE COURT: Let me stop us here. It's 6:00, actually it's a few minutes after 6:00, and some of our jurors have a lengthy drive ahead of them. We're not anywhere through with this cross examination, and I suspect there's going to be redirect, so there's no way we get this witness off the witness stand today, ladies and gentlemen.

With that, we're going to pick this as good a time as any to recess for the evening. I'm going to ask you to take your notebooks with you and place them on the table in the jury room so you'll have them there tomorrow morning. I'll ask you to be back tomorrow morning ready to go by 8:30, assembled probably before that. Try to get here about 8:15. You've done a great job so far on that. Thank you very much.

Please follow my instructions. Of course, you wouldn't want to leave without me telling you one more time not to communicate with anybody about this case. Travel safely to your homes. We'll see you tomorrow morning.

The jury's excused for the evening at this time.

(Whereupon, the jury left the courtroom.)

THE COURT: Is please be seated.

Counsel, we've been on the record 7 hours and 11 minutes today. As of this time by my records, the Plaintiff has 1

hour and 59 minutes of trial time remaining, Defendant has 3 hours and 14 minutes of trial time remaining.

Also I want to clarify one other thing before we recess for the day. During the trial today Mr. Ward used what he had marked as PX 1384, which was an email chain from Mark Taylor to Shane Mooney and others. The last date at the top of that email exchange was July the 31st of 2019. He asked me to admit that into evidence. I told him for completeness of the record I would accept it.

Likewise, today Mr. Grinstein has use 8,422,540 issued to Negus and Proctor on April the 16th, 2013. He likewise asked that I admit that.

I am going to accept both of those for completeness of the record. I'm considering both of those as demonstratives. Under the pretrial procedures, there was an earlier time where proposed pre-admitted exhibits were to be disclosed to each side with notice and an opportunity to object and defend. Those were all taken up by the magistrate judge as a part of the pretrial. The parties were clearly informed that that would be the time and place for the presentation of exhibits and issues to be raised regarding admissibility, not during the trial.

I am not admitting either of those as exhibits. They will not be available to the jury to consider during their deliberations. I am accepting them for demonstrative purposes

and completeness of the record. And I will hand the copy of the '540 patent to the Courtroom Deputy as delivered by Mr. Grinstein earlier today.

All right. We will pick back up in the morning. Hopefully we will get this witness finished, and then I assume Defendants will move on to Doctor Becker, their damages expert.

Are there issues we need to take up before we recess?

MR. GRINSTEIN: Not from the Plaintiff, Your Honor.

MR. NELSON: And just one clarification. We're not going to talk--I just want to make it clear to Mr. Proctor--about his testimony. I'm aware of Your Honor's --

THE COURT: You better not. Those are the rules.

MR. NELSON: I'm making it real clear we're not doing that. He's going to have a real nice day --

THE COURT: He's been prepped all he's going to be prepped.

MR. NELSON: Understood, Your Honor.

THE COURT: Glad we're all on the same page.

Without anything further, counsel, I will see you in the morning. I'll be available in chambers as usual if there are overnight disputes that can't be resolved. I would not be unhappy if there weren't any, but I'll leave that to you.

We stand in recess until tomorrow morning.

(The proceedings were concluded at 6:10 p.m.)

I HEREBY CERTIFY THAT THE FOREGOING IS A CORRECT TRANSCRIPT FROM THE RECORD OF PROCEEDINGS IN THE ABOVE-ENTITLED MATTER. I FURTHER CERTIFY THAT THE TRANSCRIPT FEES FORMAT COMPLY WITH THOSE PRESCRIBED BY THE COURT AND THE JUDICIAL CONFERENCE OF THE UNITED STATES.

S/Shawn McRoberts 01/11/2023

___________________________DATE____________
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